

# THE IRON AGE

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## The Place of the Basic Bessemer Process

It Had Only a Temporary Foothold in the United States—Its Extra Costs and the Reasons for Germany's Preeminence as a Producer

BY H. H. CAMPBELL

IN 1877 Thomas took out patents for the basic converter and immediately there were iron-masters all over the world dreaming dreams soon to be dispelled. It had been known for 20 years that silicon and carbon could be burned out of pig iron by forcing a blast of air through liquid metal, and now it was shown that by using lime additions with a basic-lining, the phosphorus could be eliminated by a short overblow after the carbon had been burned. Within a few years basic Bessemer converters sprang up in every iron district of Europe, and for long years many plants struggled for existence where natural conditions were unfavorable. The younger generation may not know that two basic Bessemer plants were started in the United States, the first at Steelton, Pa., in 1883, and the other at Pottstown, Pa., a few years later. At both plants good steel was made, but the operating costs were high; and in every place and in every country they are higher than in acid practice on account of the following conditions:

### EXTRA COSTS

1. Dolomite bricks are used for the lining of the converter and these are expensive, while their life is short, complete renewal being necessary after making 4000 or 5000 tons of steel.

2. Burnt lime must be added before beginning the blow, in sufficient quantity to neutralize all the silica produced and to absorb all the phosphoric acid.

3. The loss is greater. At Middlesbrough in England it runs 16 per cent; but in the best practice with direct iron it has been brought down to 10 per cent, although this may have been for only a short period.

4. More labor and more careful attention to details are required than in an acid plant, and these things cost money in the United States.

Considering the greater conversion cost, it is plain that if the basic Bessemer is to compete with the acid vessel, the market price of the pig iron used must be considerably lower than that of standard Bessemer iron. This was hardly the case even during the eighties, while after the development of transportation facilities on our Great Lakes, say about 1890, the regular Bessemer pig iron became nearly as cheap as any iron in the market. It must be understood also that the basic converter calls for an iron of a certain special composition in re-

spect to phosphorus, manganese, silicon and sulphur; and very few ores will give this special iron. To understand the subject we must take up these elements separately.

### PHOSPHORUS

The basic converter requires an iron with about 2 per cent of phosphorus, because practically all the heat produced during the blow comes from the oxidation of this element. In the early days a still higher percentage was necessary owing to irregular operation; and even to-day there are slow-running plants which need as much as 3 per cent of phosphorus, but it is possible to get along under good practice and fast working with 1.8 per cent. There are comparatively few ores that will give a pig iron carrying as much as this; but there was little trouble on this score when the basic converter was started, for on every side there were great heaps of puddle cinder, while large quantities of this material were being turned out every day from the old iron works. It remained to be discovered that a by-product ceases to be a by-product just as soon as there is a demand for it.

In the principal iron districts of Europe, it was many years before the phosphorus problem became serious; but trouble had to come sooner or later. Nearly 20 years ago, the manager of a wrought-iron plant in England said that the sale of puddle cinder was an important source of profit, while a neighboring basic Bessemer plant complained that cinder cost more than good ore. It must be remembered also that basic Bessemer plants used the same ore as the iron works and that the soft steel produced supplanted wrought iron; so the steel plants on the one hand drove the puddle furnaces out of business, and then expected to be supplied with an unlimited amount of cinder.

Thus the last 30 years have brought about a complete change in the position of phosphorus in the metallurgical world. What were once heaps of worthless slag soon became mines of ore, and to-day Sweden exports large quantities of high phosphorus ores, which are valuable just because they contain the very element that not long ago was regarded as the *bête noire* of the steel industry.

### MANGANESE

It has been found necessary to have a certain proportion of manganese in the pig iron used in the basic converter, to avoid overoxidation after the

overblow and consequent waste of the recarburizer. This oxidation is an ever present danger and it has been decided that the phosphorus should not be carried below 0.06 per cent, which hardly jibes with American specifications that insist the phosphorus shall be under 0.04 per cent. In fact, most basic Bessemer steel works would refuse to consider a specification calling for below 0.08 per cent of phosphorus and would strenuously object to any limit at all.

So it is almost always necessary to add manganese ore in the blast furnace in order to get a pig iron with over 1 per cent of manganese, and preferably 2 per cent or more; and of course these additions increase the cost of the pig iron. One plant near Hannover in Germany has ore that gives a pig iron with about 3 per cent of phosphorus and 3 per cent of manganese, and this is the only works in the world which does not have to go to heavy expense in buying either phosphorus or manganese or both.

#### SILICON

It is almost necessary that basic Bessemer pig iron should be low in silicon, and it is desirable that this element should be above 0.50 per cent. If the silicon is high, the following difficulties will appear:

1. It is the universal rule in basic Bessemer practice that burnt lime shall be put into the vessel before the pig iron is run in, and the proportion must be such that the final slag will contain about 50 per cent of CaO and not over 10 per cent of silica, and preferably as little as 6 per cent. It is plain that doubling the silicon in the iron necessarily doubles the amount of burnt lime required; and this is by no means a small item of expense.

2. During the first few minutes of the blow the silicon in the iron rapidly oxidizes and the resulting silica attacks right and left indiscriminately both the lumps of lime and the lining of the converter. When the silicon is low the temperature is also low; but when there is 1 per cent of silicon or more, the newly formed slag is hot and fluid and it makes inroads into the lining.

3. A normal slag carries nearly 10 per cent of chemically combined iron, to say nothing of mechanically held shot, and doubling the volume of slag doubles the waste of metal in the cinder.

4. Doubling the amount of slag increases the loss due to slopping. In the best practice the basic converter ejects little more than the acid vessel; but when the pig iron carries over 1 per cent of silicon, the loss from this cause is serious.

5. Doubling the volume of slag means that the final slag contains only half the proportion of phosphorus. Under good conditions the phosphoric acid should run from 16 to 20 per cent and then the slag commands a high price as a fertilizer; but if it contains only 8 or 10 per cent it is hardly marketable, for the lower the percentage of phosphoric acid the greater the proportion that is "insoluble," and therefore not available for plant food.

#### SULPHUR

It has been stated that iron for the basic converter should not carry over 0.50 per cent of silicon, but this specification often produces high sulphur, and even in the best European practice the sulphur is much higher than in our basic pig iron. Some sulphur is eliminated in the mixture, through liquation of sulphide of manganese, which oxidizes on exposure to the air; so that the atmosphere for quite a distance around the mixer is pungent with sulphurous acid; but this action cannot be relied on to accomplish any radical elimination of sulphur.

The blast furnace is the proper place to deal with this element.

#### NORTHWESTERN EUROPE

These metallurgical limitations rendered impracticable, or at least unprofitable, the use of the basic Bessemer converter in many places where operations were started more than 30 years ago. The United States has no suitable ore and, as already explained, the basic process has never made a place for itself in our country. Sweden has enormous deposits of high phosphorus ore, but there is no coal and the output of basic Bessemer steel is only 50,000 tons per year. Russia has only a limited amount of good ore, the rest being high in silica, while the coal is high in sulphur, and this country makes only 150,000 tons of basic Bessemer steel per year. Austria produces 300,000 tons, but half of the ore is brought from Sweden. Great Britain turns out less than 500,000 tons per year and production is steadily declining.

In accordance with the inexorable law of the survival of the fittest, the production of basic Bessemer steel has centered in northwestern Europe, where the basic converter forms the basis of the whole steel industry. Before the war the output in Belgium from the basic converter was about 2,000,000 tons per year; northeastern France produced nearly 3,000,000 tons and western Germany 10,000,000 tons. The basic Bessemer steel made in this little territory amounted to about 15,000,000 tons, or one-fifth of all the steel of every kind produced in the world.

#### MINETTE ORE

The foundation stone of all this activity is the Minette deposit in German and French Lorraine. This ore contains only from 30 to 35 per cent of iron in the natural state; but it is not so bad as it appears at first glance. If we imagine this ore to be subjected to a red heat, or "after ignition," as we would say, it will have the following composition: Iron, 45.7 per cent; silica, 7.9 per cent; lime, 13.5 per cent; alumina, 6.6 per cent; manganese, 0.4 per cent; sulphur, 0.05 per cent; phosphorus, 0.82 per cent, giving a pig iron with 1.68 per cent of phosphorus. The ore varies widely, but the foregoing figures are calculated from the laboratory results on over 1,000,000 tons shipped to Belgium from French Lorraine.

The poverty of this ore is not without its compensations, for the large amount of slag produced in the blast furnaces takes care of the sulphur; and some furnaces have run for weeks, or even months, with the silicon in the pig iron always between 0.30 per cent and 0.50 per cent; while at the same time the sulphur was kept below 0.10 per cent. Considerable manganese ore must be added to the furnace mixture, but such ore is quite abundant in western Germany, while additional phosphorus is obtained from Swedish ore. It was stated early in this article that the deposit near Hannover in Germany furnishes the only ore in the world which alone by itself will give a pig iron suitable for making basic Bessemer steel; but this Minette ore just described can be used by the addition of a moderate amount of phosphorus and manganese to the blast-furnace mixture, and this is why the great iron district reaching from Metz to the North Sea has come into being.

#### POSITION OF GERMANY

From a merely geographical point of view, either Belgium or France might have developed this Minette field; but it was Germany that immediately adopted the basic converter just as soon as



it had been tried in England, and even before it was well under way. England has the honor of starting both the acid and the basic Bessemer, but it was left to the United States to show the world what an acid vessel could do, while Westphalia was to develop the possibilities of the basic converter. It is rather hard to explain just how this all came about, but the facts are clear.

Looking for a moment at the acid Bessemer in our own country, we know that from the beginning almost every works made from two to five times as much steel as the best plants across the water. For many years Europeans refused to believe that we told the truth about our output, and even a personal visit by some of their metallurgists would not convince them that operations could be carried on every day continuously under whip and spur. In the late nineties, however, the facts were too well known to be disputed, and an English plant that desired to increase its output installed American equipment in its Bessemer department. Any of our foremen, with a nucleus of American workman, could have doubled the tonnage in two months, but the British steelworkers refused to wake up, and it was necessary to build a second plant and run both of them at what we would call half speed.

The Germans have done for the basic Bessemer just what we did for the acid converter; but they have not reached and never can reach the rate of production that is so common in this country, because in a basic plant there are so many little things to watch all the time and so many extra operations. The adding of the lime, the decantation of the slag and the delay that seems to be necessary after the addition of the recarburizer, all make for slower work, while, as already stated, the converter lining has a shorter life. Under these conditions it is a notable achievement when a plant of three 20-ton converters turns out 35,000 tons of steel in a month.

There are also technical problems at every step, for a variation in the proportion of silicon in the pig iron will mean a change in the weight of lime added; again, any variation in the speed of the blowing engine makes a difference in the length of the overblow, while there is no sharp warning corresponding to the drop of the carbon flame, to mark the end of the operation. Worst of all is the danger of excessive rephosphorization when the recarburizer is added; for rephosphorization always takes place to some extent, say as much as 0.02 per cent, and it may be three times as much if conditions are not just right. Finally, the composition of the slag must be kept constant so that it can be sold as a fertilizer. All these technical and practical problems were worked out in Germany long ago, and all successful basic Bessemer practice is a copy of what has been done on the banks of the Rhine.

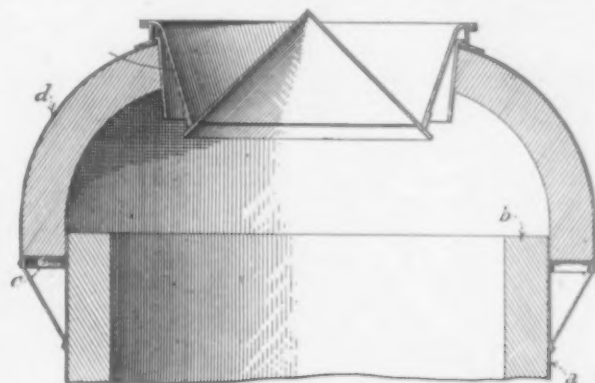
#### IMPORTANCE OF THE BASIC CONVERTER

Here in the United States we are apt to forget how important a part the basic converter plays in the steel industry. In 1913 it made nearly one-quarter of all the steel of the world, and almost as much as the acid Bessemer and the acid open-hearth put together. During the ten years from 1903 to 1913 the world's output from the acid converter increased only 8 per cent, but the production from the basic vessel nearly doubled. A great part of this basic Bessemer steel comes from Belgium and from that portion of France which is in the war zone; so all figures for the last two years are worthless. But there is every reason to suppose that production will be resumed and will increase soon after the declaration of peace.

### A New Blast-Furnace Top

A novel construction for a blast-furnace top has been invented (U. S. 1,193,750—Aug. 8, 1916) by William H. Bailey of Gary, Ind., chief engineer Indiana Steel Company. The inventor set out to devise a top to be supported independently of the masonry shaft of the furnace. The reason, as he states it, was that the masonry shaft of a blast furnace is subject to considerable longitudinal movement under expansion and contraction, and if the masonry lining for the top is directly connected to the masonry shaft and the masonry top is anchored in any manner by structural work, as is usually necessary, the top will be distorted shortly after blowing in.

A vertical sectional view through the upper portion of a blast furnace to which the new top has been applied is given in the illustration. The shell *a* of the furnace has a masonry lining, both shell and lining terminating at *b*. A plate *c*, in the form of an annular, laterally projecting shelf, is secured to the shell *a* by an angle, the outer edge



Details of a Top for a Blast Furnace

of the shelf being braced by members secured to the shell at a lower point. The shell *d* for the top is secured to the outer edge of the shelf *c*, and lined with masonry as usual. The masonry rests on the shelf *c*, and both the covering *d* and the lining are supported by the shell of the blast-furnace shaft, and are located entirely outside of it. This permits of an increase in the size of the top and provides for efficient distribution of the burden through the hopper and the bell.

While the top is not connected to the blast-furnace shaft, it is rigidly secured to the shell so as not to be blown off. Another advantage is that the construction permits of the use of a masonry lining for the top without lessening the space within which distribution may be made and providing ample space for the location of down-comers in the top if desired.

#### Iron-Ore Exports from Newfoundland

Iron-ore exports from Newfoundland for the fiscal year 1914-15 were 511,990 tons, of which 17,500 tons went to the United States, 382,260 tons to Canada, 41,300 tons to Holland, and 69,930 tons to the United Kingdom. For the fiscal year 1913-14 the total exports were twice as much, or 1,245,797 tons. The United States received 170,590 tons of this total; Canada, 785,245 tons; Holland, 122,332 tons; Germany, 51,790 tons, and the United Kingdom, 115,840 tons.

The employees of the Remy Electric Company, Anderson, Ind., manufacturer of magnets, have resumed night studies in electric work. The course will cover a period of 32 weeks. It will be the second year of the scheme. Graduates this year will receive a certificate of training for the automobile accessory field.

## THE AUTOMATIC LAND CRUISER

Part Played by American Company in Developing the "Tanks" of French Battlefields

BY W. E. FREELAND

"It is now generally admitted that the armored tractor car which met with such wonderful success in the great battles on the Somme front is originally an American invention. It is true, as Mr. David Lloyd George says, that the big machines were built by the Munitions Department and that Col. Winston Spencer Churchill urged their adoption at an early stage of the war, but the idea came from the United States.

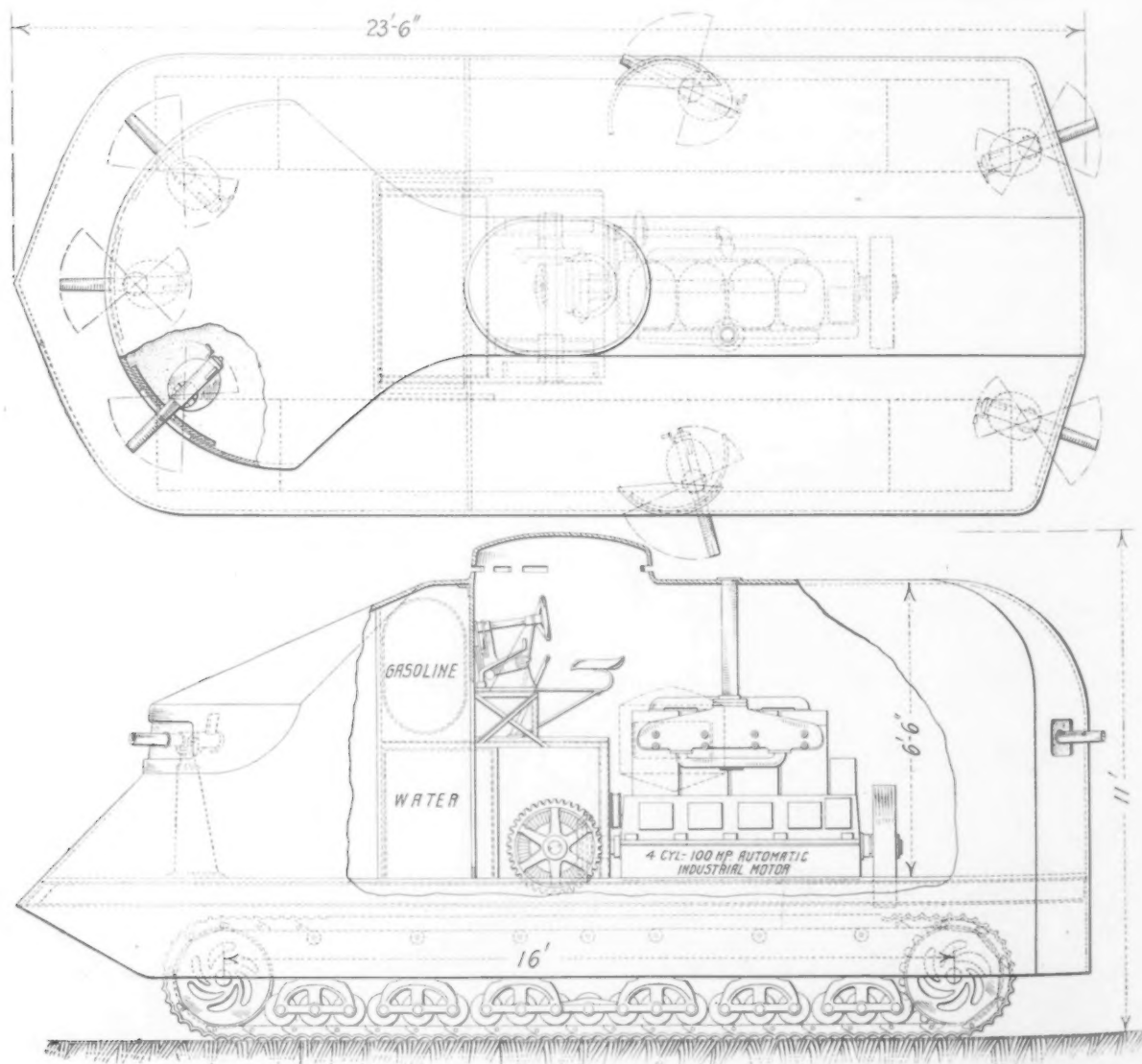
"Designs of the death dealing machine were submitted to the War Office more than a year ago, but Great Britain declined to finance their manufacture unless the tractors were made in England. This was finally agreed to. The man who brought the designs to Great Britain declines to permit the use of his name, declaring that for business reasons he does not desire to dim the glory of those credited with their introduction. He says he has designs for a tractor which probably will be even more effective."—*The New York Herald*, Sept. 20, 1916.

To understand how America furnished the inspi-

ration for the building of these effective offensive weapons for the modern trench warfare, it is necessary to go back to the early summer of 1915 to the offices of the Automatic Machine Company, Bridgeport, Conn. This company has for years supplied many of the heavy duty gasoline engines used in the large tractors built in this country and was familiar with the conditions under which tractors were working in the Oregon forests, the Louisiana lowlands and the streets of our large cities. Norman Leeds, treasurer of the company, realizing that the trench fighting of the present day had made a practical deadlock of offensive and defensive, conceived the idea that an armored tractor of the "alligator" type would make it possible to cross trenches, enfilading them, and that with sufficient power neither wire entanglements nor shell-pitted ground nor ruined walls nor any of the debris of the battlefield would offer any serious obstacle to this leviathan armadillo.

Tractors of the alligator type 24 ft. between driving wheel centers were already in use in Oregon. With the huge power and stability of these machines, it would be easily possible to cover them with armor to withstand the fire of 3-in. guns and a comparatively small crew would be as effective as many hundreds of unprotected men.

Mr. Leeds proposed that at least a thousand such



The land cruiser, so called, was suggested as a means for selling engines. The idea was to put the offensive in warfare in the ascendancy, that is, it was a means of overcoming the trench defense. The design was purely one of principle and not of detail. Any machine of this type, the thought was, would accomplish the object, as long as it was capable of traveling over the trenches and rough ground. The details of gun equipment or armor and the shape of the machine were matters to be decided upon by the British Government.



machines should be built for use in a mass formation. The front line "cruisers" would be used to conquer the territory over which they traveled; the rear lines, meantime, would be producing a curtain of fire beyond them to protect the front line while engaged in their work of reducing the fortified lines of the enemy.

It was but the work of a few days to make a preliminary sketch of the "automatic land cruiser" as he called the creation which appeared in considerable detail upon his drafting board July 9, 1915.

At this point Mr. Leeds called in Alec McNab, of the McNab Company, Bridgeport, manufacturer of marine appliances and an inventor of note, much of whose work has been connected with various phases of warfare. Mr. McNab is a retired engineer-commander of the Royal Navy and at once became greatly interested in the development of the project. After a few days of joint effort, the revised sketch here shown was produced on July 14, 1915. It is this last plan which was submitted to the British War Office.

From this point let us carry along the story in the terse language of Mr. McNab who, in a signed statement, gives these facts:

I sailed from New York on steamer St. Paul on July 17, 1915, arriving at Liverpool on July 25.

On Tuesday, July 27, 1915, I went to the War Office and saw Colonel Holden, Chief of the Army Service Corps, in which I went thoroughly into the matter and explained the apparatus to him. He, however, told me that this was not pertaining to his department.

On Sunday, Aug. 15, 1915, I left for Paris, arriving there same evening. On Aug. 17, I formally presented the blueprints of the caterpillar tractor to the officers at the French war office. Much more interest was shown than had been accorded through Colonel Holden, at the British war office.

On Friday, Aug. 20, I left Paris for London. However, previously I cabled Mr. Leeds of the Automatic Machine Company, stating that if he cared to cable over necessary expenses, I had every reason to believe that a good order would be forthcoming through the French war office for automatic engines to be installed on these tractors.

On Monday, Aug. 23, I saw Gen. E. W. Moir, controller of munitions inventions at Whitehall, London, informing him that I had left a blueprint of the caterpillar tractor with full particulars with Colonel Holden of the A. S. C. British War Office, prior to my departure for Paris. General Moir was so interested by my verbal explanation that he immediately sent me to Colonel Holden with a letter stating that he was to obtain these blueprints at once.

On returning the blueprints, as per General Moir's instructions, and on thoroughly going over the matter with him, he stated that I should hear further regarding developments in the course of a few days.

On Wednesday, Aug. 25, I received a letter from the Naval Armored Car Division at Pall Mall, asking me to attend a meeting of officers who were going to confer in regard to the caterpillar tractor. I attended this meeting as requested, which extended for several hours, and was advised that the matter would be taken up further with me in "due course." At that time I also advised them that should I not be in the country to communicate with Norman Leeds, at the Automatic Machine Company, Bridgeport, Conn. Nothing further was done; therefore this report is at end; however, I am firmly of the opinion that the recent advance on the Somme has been entirely due to this very caterpillar tractor.

On my second return to Paris, on Tuesday, Jan. 11, 1916 I was fortunate to meet my personal friend, Monsieur Corcas, secretary to M. Albert Thomas, Minister of War. M. Corcas was very much perturbed that I should have left Paris in August of last year very suddenly, as it seems that the Minister of War and other high officials were so very interested in the caterpillar tractor as submitted that they desired a further con-

ference with me, but were unable to accomplish this, owing to my departure.

In the sketch as carried over the seas by Mr. McNab, Mr. Leeds had no thought of presenting a finished product. The question of proper armament and its disposition was one to be settled by men expert in modern ordnance, not by an American engine builder. What the American wanted was to sell engines and at one time in the negotiations, according to Mr. McNab's statement, and more particularly found in correspondence and cablegrams which are in the file containing the full record of the negotiations, the prospects for an engine contract were bright.

The land cruiser as submitted to the war office was sketched in about the smallest dimensions which would be effective; there were no mechanical obstacles to be overcome in the building of much larger machines. The length over all is 23 ft. 6 in.; the width, 10 ft.; the height, 11 ft. The distance between centers of drive wheels is 16 ft. The alligator type of drive was selected in place of the more common caterpillar type because of the greater bearing surface which would enable it to cross trenches of about 8 ft. in width and would give it more stability and tractive surface on badly broken ground and because it would have no exposed front wheels to become caught or shot away. The weights are equalized throughout the apparatus as far as possible. The engine is placed a little aft of the center to compensate for the front or fighting end with its heavier weight of armament and ammunition.

Time will tell how much has been borrowed from these sketches in the building of the "tanks," as Tommy Atkins terms them.

### New Standards of Testing Materials Society

All of the revised standards, amended standards and proposed new standards of the American Society for Testing Materials have been approved by a mail ballot which has recently been canvassed. The list of standards covering specifications, tests and methods of testing and of making analyses includes 103 titles as compared with 88 in the 1915 Year-Book. The standards are effective from Sept. 1, 1916, except the revised standard specifications and tests for Portland cement, which by action at the last annual meeting will not become effective until Jan. 1, 1917.

The amendments to the by-laws also carried and this means that the publication of the Year-Book has been discontinued as an annual and instead will appear as a biennial publication beginning with the 1916 book of "A. S. T. M. Standards." This volume will contain about 800 pages and is expected to be issued toward the end of October.

The membership of the society has now risen to 2104 members, a net gain of 33 since the annual meeting.

The Missouri, Kansas & Texas Railroad, which has general offices at Dallas for its Texas lines, has set aside a tract of land adjacent to its new terminals in San Antonio as sites for manufacturing plants. It is stated by T. L. Peeler, industrial commissioner of the railroad, that more than 30 concerns have already obtained locations in the new industrial center, and that they will build plants as soon as the railroad terminals are finished.

The workmen's compensation board of Pennsylvania announces that it will provide counsel to appear in the courts in behalf of persons without funds who have been awarded compensation and whose employers have appealed cases to courts. This policy, it is stated, will also apply to dependents of those killed and whose compensation claims may be contested.

# Use of Titanium in Making Steel Castings\*

How Best to Add It—Its Efficiency as a Deoxidizer Compared with Other Agents—As a Substitute for Manganese

—BY W. A. JANSSEN—

NOTWITHSTANDING all that has been said concerning the harmful effects of phosphorus and sulphur in steel, the occluded oxides and gases, such as iron oxide,  $\text{Fe}_2\text{O}_3$ , and an undefinable oxide, probably  $\text{FeO}$ , free oxygen, nitrogen and occluded slags are the real causes of many of the troubles of the steel-maker. It is with the occurrence of these elements and their elimination that he is especially concerned. It has been definitely demonstrated that the presence of oxygen, and possibly nitrogen, in steel reduces its static strength, dynamic properties and abrasive values and increases its tendency to corrode. To-day the presence of oxygen and oxides in steel is considered

it remains in the steel either as an alloyed constituent, or the products of its oxidation may remain as inclusions. The usual analyses for silicon do not disclose whether or not the silicon is present in the steel as an alloyed silicide, as silica or as the silicate. Even if the silicon manifest itself as a silicide, showing a high silicide percentage, a wild heat is apt to result, requiring the use of a further deoxidizer (aluminum) when pouring the molds. In conjunction with manganese, double silicates of iron and manganese frequently are formed. Such a constituent may contribute to excessive segregation, although singularly, a dirty steel often discloses very little segregation.



Fig. 1—Cracks Extending Through Small Groups of Alumina Inclusions in Titanium-Treated Steel to Which Aluminum Also Was Added

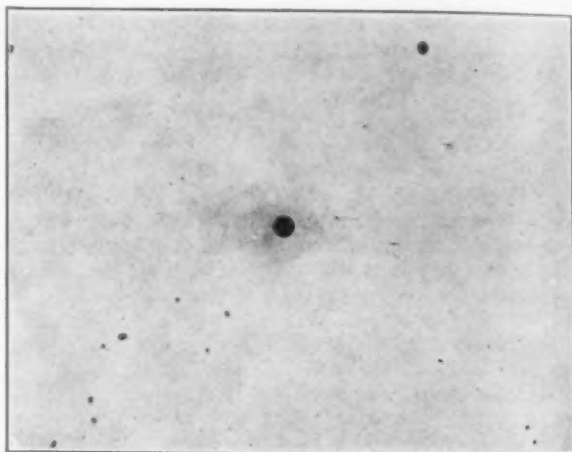


Fig. 2.—Typical Small Groups of Silicates and Sulphides in Titanium-Treated Steel

more harmful than even relatively large amounts of phosphorus and sulphur. In a measure the same is true of nitrogen, although the investigations in this direction have not been sufficiently complete and the results are variable and uncertain.

With the advent of ferroalloys of silicon and manganese containing high percentages of the active elements came the hope of an assured uniform quality of steel. As deoxidizers, modern ferroalloys are efficient in a measure, but have certain limitations. It is the function of these deoxidizers to combine with the occluded oxides; the resulting products rise and become a part of the slag. Unfortunately the temperature of the metal and its resultant fluidity do not always permit these to complete their cycle and rise to the slag; they are entrapped as inclusions and the occluded gases are not entirely deoxidized. The known presence of oxides in excess of the amount which can be deoxidized by the usual additions of ferrosilicon and ferromanganese is not permitted because of specification tolerances for manganese and silicon content.

## SILICON NOT A STRONG DEOXIDIZER

Silicon, comparatively speaking, is not a strong deoxidizer, and when it is added to steel a portion of

Titanium, until a comparatively few years ago looked upon as one of the rare metals, undoubtedly is one of the most powerful deoxidizers and denitrogenizers known. At the present time it may be obtained as one of the ferroalloys. Its chief value lies in its positive action in the removal of the occluded oxides, nitrogen and entrapped slags, due to the fusibility of titanate oxide as formed and its greater stability as compared with iron oxide. Its function is further augmented by the increased fluidity due to the increased temperature because of the exothermic reaction, thereby permitting freer movements of the oxidized products to slag.

## HOW TO USE TITANIUM

The present-day method of using ferrotitanium is to augment the incompleting cycle with ferrotitanium after the other deoxidizers have been added. These may be added in the ladle, or in the furnace before tapping. After the titanium has been added, it is imperative and essential that the ladle be held from 5 to 10 minutes before pouring in order to allow time for the completion of the reactions. No fear need be had of the chilling of the metal inasmuch as the temperature is raised appreciably, due to the exothermic reaction. It is essential that the titanium be not added until after the additions of ferrosilicon and ferromanganese have been made. On account of the greater affinity

\*From a paper presented Sept. 15, 1916, at the American Foundrymen's Convention in Cleveland, Ohio. The author is superintendent of the Bettendorf Company, Davenport, Iowa.



of titanium for oxygen, the ferrosilicon and ferromanganese must be given an opportunity to complete their primary deoxidation, thereby eliminating selective oxidation. It is also essential that the ferrotitanium be added as soon thereafter as possible so that the alloy does not become a part of the slag and there perform its deoxidation.

Titanium at about 800 deg. C., combines with nitrogen to form the stable titanium-nitride which usually finds its way to the slag. Microscopic examination, however, sometimes reveals the existence of occluded tiny, hard, pink crystals of titanium-nitride, which, however, are less harmful in effect than the occluded nitrogen. With all these beneficial effects, its use beyond a certain amount is of no avail and in a measure harmful.

Titanium, singularly, does not form alloy steels as do the other deoxidizers, such as silicon, manganese and vanadium. Many analyses of titanium treated steels do not reveal a titanium content higher than 0.025 per cent. With the use of alloys containing more than 10 to 15 per cent titanium, the results are not as effective, owing to the slower rate of solution.

The amount of ferrotitanium used depends in a measure on the kind of steel to be treated. In rail steel, an addition of 13.2 lb. of the 15 per cent alloy per net ton, representing a metallic titanium addition of 0.10 per cent is satisfactory. In the use of titanium for steel castings the addition of  $1\frac{1}{2}$  to 2 lb. per 1000 lb. of metal charged, in addition to the usual ferrosilicon and ferromanganese additions is usually sufficient to deoxidize the steel. The amount of ferrotitanium added, however, should be dependent on the quantity of impurities which are to be removed and the process of manufacture.

#### VANADIUM AND TITANIUM COMPARED

During the past few years specifications for steel castings for specific designs and service have demanded the use of vanadium. Although the presence of vanadium in steel undoubtedly has improved its physical properties, it is questionable whether vanadium manifests its maximum efficiency in plain carbon steels, especially within the carbon range of steel castings. The vanadium addition is calculated as an alloying constituent, the amount present in the final product being within three or four points of the desired calculated content. Vanadium has manifested its greatest value when used in conjunction with chromium and nickel as a deoxidizer. Vanadium is only 70 per cent as efficient as titanium and has but little effect on nitrogen.

#### WHEN STEEL BECOMES STRONGER

With the elimination of the occluded oxides and slags, steel, because of its increased density and homogeneity, has improved static and dynamic properties. A comparative test of 20 untreated and treated heats showed an increase in the ultimate strength of approximately 15 per cent with no reduction in elasticity and contraction. A remarkable endurance test was conducted by Enrique Touceda on untreated and titanium-treated steels of practically the same chemical composition. The test was conducted in a Wright-Souther machine at a fibre stress of 38,872 lb. The untreated steel withstood 2,676,000 revolutions at this pressure, whereas the titanium-treated steel withstood 18,274,900 revolutions at pressures varying from 38,872 up to 45,939 lb. fibre stress.

Many tests made on rails and machine parts indicate the ability of titanium-treated rails to withstand shocks and abrasion, the life of gears and rails being about 50 per cent greater than those

made of untreated steels. In a comparative test on gears it was found that titanium-treated gears, although made of 0.20 per cent carbon steel, too soft to be ordinarily considered acceptable for machine parts, outlasted untreated steel gears of the same composition three to one.

#### TITANIUM AS A SUBSTITUTE FOR MANGANESE

With the present high cost of ferromanganese and the attendant shortage of supply, the writer has carried on some extensive experiments to conserve his ferromanganese without affecting the quality of the product. Realizing that the manganese present in steel castings contributes only indirectly in increasing the strength, the purpose of these experiments was to reduce the manganese from 0.75 to 0.50 per cent. To be assured of the same strength, the usual ferromanganese addition was reduced from 320 lb. for a 20-ton heat to 200 lb. and the ferrotitanium addition increased from 60 to 120 lb. Tensile tests for these heats showed an average ultimate strength of 68,000 lb. for a 0.20 per cent carbon steel, with an average elongation of 30 per cent and a reduction of area of 47 per cent.

It can be well appreciated that the use of ferrotitanium in making steel castings is no longer an innovation, but rather a necessity to offset the vagaries and shortcomings of present-day practice.

#### Brass Manufacturers Hold Quarterly Meeting

The National Association of Brass Manufacturers concluded its autumn meeting at the Traymore Hotel, Atlantic City, Friday evening, Sept. 15. The meeting was successful in every respect. Numerous important matters were disposed of, among them being the following:

The question of equalization of freight rates and establishing a proper scale or chart covering them; reaffirmation of an order passed at Cleveland March 17, 1910, adopting as a standard uniform center  $7\frac{1}{2}$  in. for all bath cocks with ball offset couplings; adoption of a uniform distance from rear of flange of bath cock to the center line of couplings of  $2\frac{3}{4}$  in. minimum to a maximum of 3 in., which will facilitate matters very materially with both jobbers and plumbers; adoption of a standard hose nozzle and swivel nut for bath cocks, which makes the taper on the nozzle of the bath cock, the swivel and the hose connection of a standard size, so that they will be interchangeable; appointment of a committee to present a uniform standard thread and taper of all basin cock shanks so that they will be likewise interchangeable.

The matter of guarantee on goods, which is considered more or less of a useless and meaningless form and a relic of the darker ages, was discussed at some length and a committee was appointed to give it further consideration.

The meeting having been polled as to the labor situation, trade conditions and future prospects, the result showed that the majority had been compelled to raise wages since the meeting held in Chicago in June, and several had been visited with strike troubles. The outlook was reported as being very good.

The next meeting will be held in New York City Dec. 13 and 14, at which time a banquet is to be provided, along with suitable entertainment, the arrangements for which were placed in charge of a committee. A number of new members were taken in.

The scale of operations in the motor-truck field is indicated in the recent purchase by Stedman Bent, hauling contractor of Philadelphia, Pa., of fifty 5-ton trucks from the White Company, Cleveland.

The Commercial Club, Richmond, Ind., is raising \$100,000 for a factory fund. In the first three hours of canvassing \$30,000 was subscribed.



## FIRE RISK IN THE FOUNDRY

### Causes of Foundry Fires and the Precautions Which Will Prevent Them

Since 1906 there have been 475 fires in foundries, according to reports received by the National Fire Protection Association. In a paper presented at the Cleveland meeting, Sept. 11-16, of the American Foundrymen's Association by Franklin H. Wentworth, secretary of the National Fire Protection Association, the causes of these fires are tabulated and methods of preventing similar fires are outlined. Most of the fires were preventable, and many of them were due to hazards not usually associated with foundry. For instance, five fires were due to the dipping of hot cast-iron pipes, made in the foundry, into asphaltum or tar to rust-proof them.

The cupola is the most prolific cause of foundry fires. Over 40 per cent of the fires from known causes originated here, and nearly all of these could have been prevented by such simple precautions as removing combustible material from the vicinity of the cupola, using only non-combustible roof coverings, and equipping the cupola with a hood or other device to prevent sparks from being showered over the neighborhood. Next to the cupola the core oven is the most frequent cause of fire. This hazard, also, could be almost entirely eliminated by giving careful attention to the construction of core ovens and their surroundings. Among the most frequent common causes are locomotive sparks and heating. The former is in part explained by the fact that many large plants have their own locomotives which enter various buildings, while the latter is no doubt largely due to the habit of constructing in the foundry proper for the use of the foreman or superintendent a rough office with a carelessly installed stove.

The record shows that 62.7 per cent of all foundry fires occurred at night, and for this reason they may smolder for several hours unless a watchman is present to detect the fire. However, 32.9 per cent of all foundry fires were discovered by the watchman, which is a very good record. It is doubtful if there is any industry in which a watchman has better opportunities to prevent loss by fire than in a foundry, and consequently great care should be used to select a suitable man for this position.

An examination of the record of automatic sprinklers in this class of property indicates that they have been very successful, for there were only 2.5 per cent of the fires classed as unsatisfactory and only 3.8 per cent of fires in buildings equipped with automatic sprinklers resulted in large losses.

#### FOUNDRY FIRE HAZARDS

Foundries have special fire hazards which are not present in other industries. Some of these are as follows:

1. *Preparing the Mold.*—Drying out the moisture from the mold by means of temporary stoves or furnaces placed directly in the mold, by means of heating flues conducting heated air to the surface of the mold, or by means of portable torches, forms a hazard which has caused some, although a small number, of fires.

2. *Core Ovens.*—Over 15 per cent of the reported foundry fires are traceable to the core oven. Nearly all could have been prevented. Special effort should be made to remove all woodwork from the vicinity of the core ovens and their flues. If this is impossible, the woodwork should be covered with sheet metal, with lath and plaster or Portland cement, or an asbestos covering. A flue or oven too hot to be touched by the hand is dangerous. Stacks or flues passing through the roof should be protected by metal thimbles. Lumber and flasks should be kept from the top of core ovens. The ovens should be kept in good repair, and all cracks should immediately be filled with cement. Where possible, the core ovens should be outside the building, only the door opening into the foundry.

3. *Melting Metal.*—The cupola has been the cause of 42.7 per cent of all foundry fires, the larger portion of these resulting from sparks from the cupola. Fires

from the cupola may be prevented by the observance of the following rules: (1) All roofs within possible range of sparks from the cupola should be covered with non-inflammable material; (2) the cupola should be equipped with a hood or other device to prevent sparks from being showered over the neighboring roofs; (3) all unprotected inflammable material should be removed from proximity to the cupola walls.

Where fireproof roofs are not used they should be covered with metal with no exposed wood ventilators, frames or skylights. Special precaution should be taken to prevent the roof igniting at the point where the cupola stack passes through it. Charging floors for cupolas should be of non-combustible material, such as iron, brick or concrete. There is considerable danger of fire when the cupola is dumped, and a hand hose should always be placed nearby for such emergency. The brass furnace does not present as serious a hazard as the iron furnace. It should not, however, be in proximity to woodwork, and should never be used in rooms which do not have fireproof floors.

4. *Pouring.*—Fires may be caused by the ignition of wooden flasks when the molds are poured. Such fires usually can be extinguished by throwing sand upon them. Hot metal, also may be spilled upon the floor or on combustible material nearby. If all combustible substances are kept out of the foundry, there is little likelihood of fires starting from the handling of hot metal. A few fires have been caused by the explosion of molds, due probably to excessive moisture. This cause is comparatively rare. Many fires have resulted from hot smoldering wooden flasks, and as soon as the castings and sand have been shaken out, the flasks should be removed from the foundry. They should not be put into storage until several hours have elapsed, in order to insure that there are no live sparks in them. The only damage from iron flasks is that they may be placed, while hot, against a combustible wall.

5. *Cleaning and Finishing.*—In general there is but little fire danger in the cleaning of castings. Where the castings are pickled, care should be used in the storage of the acids used. In grinding castings there is a slight hazard from accumulations of emery wheel dust, which if wet may heat and ignite spontaneously. The rag wheels used for burnishing, buffing and polishing present a little danger from overheated bearings, spontaneous combustion or sparks from the dust. A good dust collecting system, with metal blower pipes discharging into a fireproof receptacle is advisable. Lint should not be allowed to collect in the room, and the receptacle frequently should be cleaned.

6. *Special Hazards.*—Many establishments which are primarily foundries carry on some other process in conjunction with the foundry work, and it is necessary to consider this feature in the proper study of the fire hazards of such a plant. Dipping of piping and pipe fittings in asphaltum or tar, to protect them from corrosion, should be carried on in a detached building. Painting, lacquering and japanning are other special processes which also should be carried on in a separate building particularly constructed for the purpose. The increasing use of fuel oil for heating core ovens and small portable torches for numerous other purposes has introduced an appreciable hazard into foundries. This material should be stored in an approved manner, and special precautions should be taken to see that all piping, tanks, etc., are maintained in good condition and free from leaks. It is advisable to have piping so arranged that in case of emergency the supply can be readily shut off at the source, and the piping drained.

#### AUTOMATIC SPRINKLER PROTECTION

It was at one time thought that automatic sprinklers were not suitable for use in foundries on account of the supposed danger of water being discharged on molten metal. Experience has shown, however, that this does not present any danger whatever and that automatic sprinklers can be used just as advantageously in foundries as in other properties. The fire record of foundries indicates that sprinklers have been very efficient when installed in such properties, and that if the system is properly laid out there is small chance of a fire reaching serious proportions. Sprinklers are

particularly effective in foundries because of the fact that a great many of the fires occur in the night after smoldering for several hours. These fires might not be discovered until they had made considerable headway. An automatic sprinkler system will promptly check any such fires and at the same time announce their discovery if an alarm system is included in the equipment.

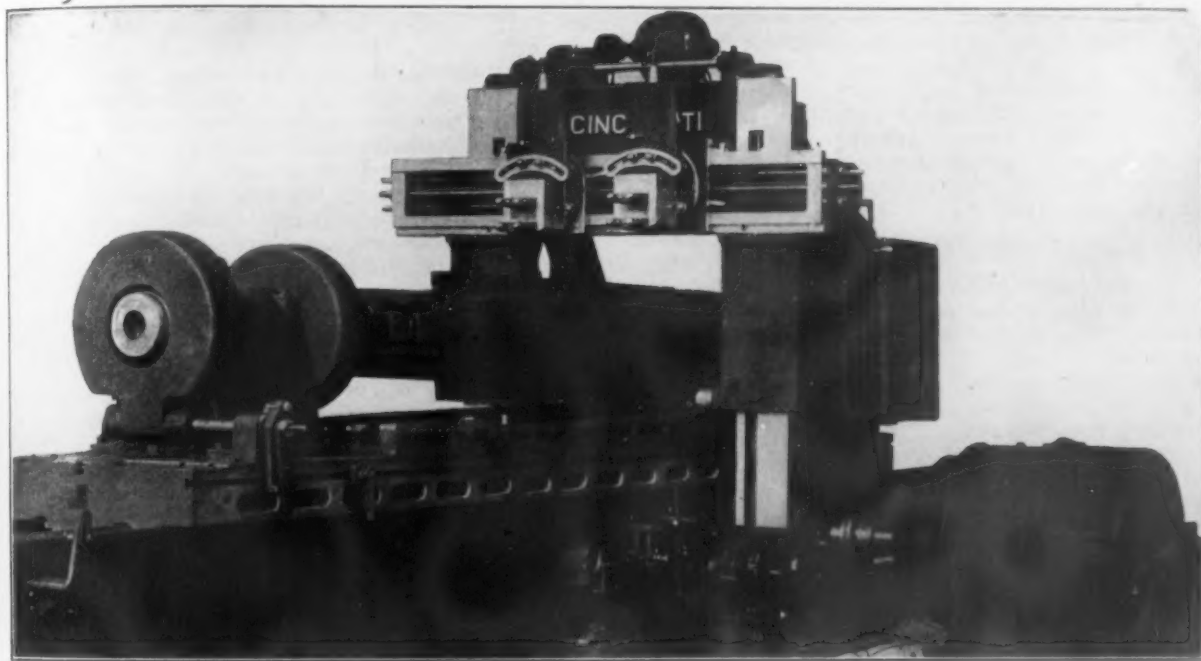
#### Bolles Iron & Wire Works Expanding

The J. E. Bolles Iron & Wire Works, Fourth and Porter streets, Detroit, Mich., manufacturer of plain and ornamental iron, wire work, etc., has increased its capital stock from \$150,000 to \$500,000 to provide for expansion. It has purchased the Fox Brothers' factory site on Hastings Street and East Milwaukee Avenue, covering three acres, with frontage on the Michigan Central, Grand Trunk and Wabash railroads, where it will erect a new plant in sections. The first section

#### Machining Howitzer Guns on a Planer

The Cincinnati Planer Company, Oakley, Cincinnati, Ohio, has recently completed a 48x48x18-ft. planing machine especially adapted for planing 9.2-in. howitzer guns. The table is started on its cutting stroke in the regular way and the cross rail, instead of maintaining a fixed position, is guided by the rollers over the cams on the table, causing the rail to rise and fall while the table passes under it, thereby providing a taper attachment. At the end of the return stroke, the ratchet lever on the worm shaft strikes the tappet at the side of the bed, making the lever pass through an arc which gives the worm a partial revolution. The gun is thus revolved an amount equal to the feed usually provided by the feed gears.

The cross rail, which has a sliding fit on the housings, is provided with two special brackets. These are bolted under the rail and are further held to the housing face by a clamp on both the outside and inside.



Planing Machine Rigged to Guide the Cross-Rail and Cause It to Rise and Fall as the Table Moves

will be of modern steel construction, 135 x 460 ft., with mezzanine floor. The heavy forging and press department will be 60 x 460 ft., with an overhead 10-ton traveling crane. The company is placing contracts for several very heavy machines for forming stair treads and metal furniture, including a stair-tread press claimed to be the largest so far known, capable of forming a steel tread  $\frac{1}{4}$  in. thick by 10 ft. long. Its drop forge department will turn out light forgings and metal stampings. The eight present departments will be increased to twelve. The plant will be entirely electrically equipped. The present plant, which is only six years old and contains 51,000 sq. ft., has been outgrown and the building will be turned into a loft building. The new plant is to be ready for occupancy April 1, 1917, and will include a bronze and malleable iron foundry, on which work will not commence until next spring. The company has seven months of contracts ahead at the present time. The directors are J. E. Bolles, Adam Kolb, J. B. Mansfield, Alfred J. Jones and E. B. Newton, the last named having been added recently to the board.

The Federal Export Corporation, 111 Broadway, New York, has under negotiation the purchase of several thousand tons of steel billets for shipment to foreign buyers. It has received additional orders for railroad material from the General Omnibus Company of Paris and the Eastern Railways of France, also for wire rods required by French industrial companies. J. R. Munoz, secretary of the company, who recently went abroad, is now at its Paris office.

A roller is mounted on each of these brackets at the lower end and projects over the side of the table on a cam which is mounted on each side of the table. This cam has a contour corresponding exactly to that of the gun.

It will be noted that the combination of these two motions, that is, the turning of the gun on centers at the end of each stroke and the raising and lowering of the crossrail, while the table is in motion, causes the tool to plane both a curve and a taper on the outside of the gun. When planing the straight rectangular projections on the gun the rail is raised a little clear of the cams and bolted fast to the housings, as is done in ordinary planing. The ratchet lever is also disengaged and the feed obtained through the regular feed gears on the end of rail.

The front center or headstock shown at the end of the table is provided with a large expansion chuck. This is a part of the spindle on which a large worm wheel is mounted on the opposite end. The worm that engages this large wheel is keyed to a shaft, having a ratchet lever mounted on the outer end. This ratchet lever engages the tappet fastened at the side of the bed at the end of each stroke and revolves the gun for the next cut as before stated.

Trigg furnace, seven miles west of Cadiz, Ky., which has been out of blast for many years, is reported to have been purchased by Tennessee interests, who have also acquired 5000 acres of mineral and timber lands, with the purpose of starting the furnace again.



# The Use of Borings in Cupola Operations\*

## The Various Methods for Introducing Them and the Cost—Briquetting Regarded as Not Economical—Discussion by Doctor Moldenke

—BY JAMES A. MURPHY—

THE melting of iron borings and even steel chips in the cupola for the double purpose of reducing mixture costs and bettering quality is not by any means a new theme for foundrymen to discuss, for in one form or another they have been successfully melted for many years, some methods being more successful and more economical than others.

About thirty years ago a patent was granted to Asa Whitney, of Philadelphia, covering a method of melting borings in wood boxes. This method is in use at the present day by some leading foundries and the results from a quality point of view seem to warrant its continuance. Many other methods are employed, some of which have been subjects of exploitation, and several patents of doubtful value have been granted. A number of the methods indicate an ignorance of the principles involved, while others are freakish, and not a few are pure fakes.

### MELTING LOOSE CHIPS UNSATISFACTORY

The melting of chips loose in the cupola has been tried both alone and in combination with regular mixtures with very indifferent results. When melted alone the necessary heat will not penetrate the mass, the under and outer edges of the charge only being melted to varying depths depending on the quality of the fuel, the blast pressure and the thickness of the charge. When chips are charged promiscuously with the pig and scrap, the pyrotechnical display at the door and top of the cupola stack indicates the destruction of the elements of which they are composed. Both of these methods have long been abandoned. A few foundrymen, however, lay a thin bed of borings on the cupola bottom. The melting iron coming down on the borings melts and absorbs them, but this is done at the expense of heat that may be badly needed by the iron. I consider this method for either chips or other small particles hazardous in the extreme where particular castings are made.

In the middle eighties a foundryman in Scranton, Pa., conceived the idea of filling old powder cans with these borings and charging them into the cupola the same as pig and scrap. The method was said to be very successful and was continued as long as the supply of old cans held out. For years, nothing was found for a substitute except wooden boxes.

### ACCIDENTAL DISCOVERY OF A CONTAINER

Along about 1904 Stanton Griffith, foundry superintendent of the Fairbanks-Morse Company, Beloit, Wis., was experimenting with the melting of borings in various kinds of containers, none of which was as satisfactory as Mr. Griffith desired. As Newton's discovery of the law of gravitation was accidental, so the method that I am going to describe was accidental to Mr. Griffith through the obstreperousness of a tomato can that found its way into the household furnace where it remained intact for some time, a decided obstacle to good and thorough combustion. Its remarkable state of preservation after going through the fierce fire that is necessary to keep a Beloit home warm and comfortable certainly classed it as an ideal container for melting borings, but as its size was against it a similar but larger can was made from regular lengths of stovepipe, crimping the can in at each end when full.

This method proved so successful that I was attracted by it, and from the results of several tests that

I made I concluded that no other method gives as good, as economical or as reliable results.

### TEN-TON HEATS SHOW SMALL LOSSES

The stovepipe lengths will hold about 50 lb. It is preferable to use either a wood, iron or steel disk for the top or bottom of the cartridge. The containers can be filled at the machines by machinists' helpers at very little if any cost, as the borings must be taken away anyway. The cost of preparation for the cupola is about \$2.50 per ton.

On three different occasions I melted 10 tons of these canned borings alone, using a blast pressure of from 9 to 10 oz., our regular blast being from 14 to 16 oz. All three of these heats showed a loss of less than 2 per cent, which seems remarkable. The charges were carefully weighed under my own supervision. A 10-ton ladle was weighed on a crane scales and then placed under the cupola spout, and when the contents of the cupola were run into it, it was weighed again with the above results.

The iron in each case was white and in no way fit for commercial machinery castings. It showed no tendency to stick to the ladle, but was hot and fluid. A 6 x 6-in. section poured from the ladle was white all through, not a trace of graphitic carbon being visible near the center. The melting of borings in cans or cartridges is being practised by a large number of foundries engaged in both light and heavy work. There is no patent on the process. It is beyond question a thoroughly successful method.

In 1908 a patent was granted to Walter F. Prince for melting borings in a vertical tube or casing having a higher melting point than the chips. The method at first was open to many serious objections, some of which have since been removed. Borings can be successfully melted by this method, but it lacks what might be called mobility, as all the borings are only in one part of the cupola in a vertical column, with fuel only partly surrounding it, whereas, with the cartridges, they can be distributed among the charge, giving a better mixture and insuring more even melting.

### BRIQUETTING NOT ECONOMICAL

The briquetting of borings by the German method, that is, subjecting them in suitable molds to great pressure, is a successful method, but the cost is high and there is a considerable melting loss. It is said that the breaking or spalling of the corners and edges of the briquettes represents a great loss. The briquetting of borings through the use of cement, canna pitch or any other wet binder is without question a great failure. The rapid generation of oxygen when moisture comes in contact with the borings soon leaves only a lump of rust to put in the cupola and when used in this way is productive of bad castings, as pin holes and so-called blow-holes are prevalent. The melting loss by this method I found by experiment to reach as high as 60 per cent, while the resultant metal was bad. Castings poured with it for experimental purposes were very unsound and literally honeycombed with holes, while on the other hand castings poured from similar metal, taken from a ladle that was filled from the cartridges, was sound all the way through and showed no signs of pin holes or any other unsoundness.

### CONCLUSIONS

As a practical proposition the use of borings in binder bound briquettes is a failure. The briquettes made under enormous pressure are satisfactory, but the

\*A paper here given substantially in full, presented at the American Foundrymen's Convention in Cleveland, Ohio, Sept. 15, 1916. The author is with the Hooven, Owens & Rentschler Company, Hamilton, Ohio.



cost and melting loss are much higher than when melted in cans or cartridges.

The tube method introduced by Mr. Prince has very narrow limitations as to the amount used, this being governed by the size of the tube which of necessity must be comparatively small. If a multiplicity of tubes is used there is great danger of oxidation, as no fuel is underneath them. They can only be placed in one position in the cupola and that a specially prepared one on the side with a special door cut for the purpose. The attendant labor and waste of filling close to terrific heat is another objection.

With the cans or cartridges no extra labor is involved on the charging floor and the given amount to be put on any charge can be as evenly distributed throughout the charge as any component part of it. The cost of canning the borings exclusive of the labor of filling them is about \$2.50 per ton. This filling labor should hardly be counted under most circumstances, as the borings must be taken away from the machines and the helper may as well fill the cans as to use any other receptacles.

Borings melted by this method are a decided strengthener of castings and tend to give a closer grain. I have used them in various percentages in all kinds of work from the heaviest parts of high class machinery down to light automobile castings with unvarying beneficial results.

The cost of wooden boxes is also about \$2.50 per ton and the cost of tubes very little less. The cost of briquettes varies greatly. So many variables have to be taken into account and the method is so unreliable that it is not worth pursuing.

#### Discussion

Dr. Moldenke submitted a written comment on Mr. Murphy's paper as follows:

I regret very much to differ with Mr. Murphy on some of his facts and conclusions derived in connection with the use of cast borings in foundry practice. Unquestionably all the methods he enumerates will give good results if operated under correct melting practice, and all of them will give bad results if the charging is bad, or the cans, briquettes or stovepipes become damaged and allow loose borings to drop into the bed and before the tuyeres.

Mr. Murphy's estimate of the cost of the several processes is not altogether correct, as while he may be right about wooden boxes and his cartridges at \$2.50 a ton ready for charging into the cupola, the method of Mr. Prince costs no more than about \$1.50 a ton (exclusive of royalty) and that of briquetting under high pressures about the same. The two last mentioned methods give good results, as does Mr. Murphy's can method, where medium and heavy castings are the rule, and these will machine nicely and without blow-holes, if the charging and melting have been done properly.

For very light castings, however, particularly where high speed machining is essential, no process of using cast borings will fill the bill, as the melting of material so prone to oxidation as this is bound to harden the metal. The mistake made in introducing both the tube and the briquetting methods into foundries has been in going to specialty shops machining enormous numbers of very light castings. Here the saving in the mixture is more than offset by the extra cost of machining, and it does not pay.

For general work, as stated, the three methods work out all right if carried out correctly. Mr. Murphy's can method costs the most, Mr. Prince's is cheaper, but has the disadvantage of the tubes opening up and spilling the borings, if in careless hands. The briquettes under high pressure work all right if not made too large in cross-section and the pressure is sufficiently high. That Mr. Murphy's conclusion in regard to briquettes that "the method is so unreliable that it is not worth pursuing" is entirely incorrect is shown by the fact that to-day there are 25 high pressure briquetting plants in Europe in full operation and supplying hundreds of foundries with their borings in briquette form. In this country the cost, including royalty, will run between \$1.25 and \$2 a ton, depending upon the weight of borings compressed at each impulse.

A further criticism I must make is in regard to Mr. Murphy's remarkable tests in melting canned borings, his loss being less than 2 per cent. I cannot accept this as possible, and rather judge that some error in manipulation has escaped his attention. I have had many samples of cast borings analyzed for their iron content. The very best of them—sold at a premium for their comparative freedom from extraneous matter—gave less than 90 per cent actual iron. Ordinarily cast borings run nearer 85 per cent iron than 90 per cent. This accounts for the comparatively poor reports gotten when any process of melting borings, whether in cans, tubes or as briquettes, is carried out, using borings only. These results show from 12 to 20 per cent loss in melting, but it is forgotten that from 10 to 15 per cent of the borings was not iron in the first place.

Again, any rusting from exposure of the borings before canning or briquetting means just so much iron removed from the possibility of melting, as iron oxide (rust) goes into the slag.

In view, therefore, of the importance of saving values, the use of borings should be encouraged, but in their proper place. It will pay foundrymen making medium and large castings, and small castings not requiring machining, to look into the matter carefully, as economy will soon be the order of the day. The European foundrymen have done so, and the briquetting process, under very high pressure, seems to have filled the requirements best, as the tube, can and other methods of introducing borings in their loose form have not remained live issues.

#### New Steel Casting Shop for Chicago Territory

A new foundry, designed to supply steel castings weighing from a few ounces to over twelve tons, is nearing completion at Benton Harbor, Mich., by the Superior Steel Castings Company. It is located on a 10-acre site near the Pere Marquette, Big Four, Michigan Central and two Interurban freight stations as well as the Lake Michigan docks of the Graham & Morton Line and Benton Transit Company. The buildings are all of steel construction with electrically driven machinery throughout the foundry as well as the carpenter and pattern shops. The main section of the foundry is served with a 20-ton electric traveling crane with a 5-ton auxiliary hoist, also a 10-ton electric traveling crane and air at 100 lb. pressure for pneumatic tools. The main building covers 30,000 sq. ft. of space besides the storage bins and yards for flasks and metals.

The foundry is further equipped with a 12½-ton acid-bottom open-hearth furnace, which uses oil for melting, and is capable of making 21 heats per week, having just been proved in that respect. The charging floor is of steel-plate construction, served with an electric elevator, enabling quick and easy handling of raw materials. A considerable portion of the work is molded in green sand but a good quantity of dry sand molds are made. Most of the small work is handled in the bench room, which is 36 x 100 ft., fitted with trays and other special equipment for this class of work.

A large car-type annealing furnace, with oil burners and pyrometer, has been provided for the special heat treatment of the steel castings. The cleaning department, which occupies the south end of the main building, is completely equipped with floor and swing grinders, Pangborn sand blast with dust arresters, Oxyweld cutting torches to remove large heads and gates, etc.

The principal officers of the Superior Steel Castings Company are as follows: S. E. Doster, president; W. R. Gilmore, vice-president and general manager; C. A. Pratt, secretary and treasurer. The main office is at the works.

Two evening courses of study in heating and ventilation, taking the form of lectures, are announced by the New York School of Heating and Ventilating, room 511, World Building, New York City. The series of elementary lectures will occur on Monday evenings beginning Oct. 9, and an advanced course has been scheduled for Wednesday evenings.

# Manufacture and Properties of Semi-Steel\*

Its Use as Projectiles — Some Historical Facts—Steel as a Reducer of Carbon—Benefits of Manganese—Strength and Endurance

— BY DAVID M'LAIN —

**W**HILE it is true that semi-steel has not been recognized in iron and steel nomenclature, still, as it ranks among the most valuable products of the gray-iron foundry, it should be accorded proper recognition and standard chemical specifications covering the different classes of castings should be clearly defined. I will admit it is rather unfortunate that any cast metal containing from 3 to 10 per cent steel is designated as semi-steel, and in this particular we are in hearty agreement with those who consider that semi-steel is a misnomer. Our contention always has been that no metal could be defined as semi-steel unless it contained from 25 to 50 per cent steel.

More than 1,000,000 tons of semi-steel was made last year, and every foundryman sooner or later must be able to make real semi-steel, as engineers

proved very difficult, as the walls were only 5/16-in. section, while they were hydraulically tested to 200 lb. per sq. in. In those days other engineers allowed 1 in. and more section for 200 lb. pressure, but Mr. Christensen saw the light in advance. It was a great advantage to the mechanical world that he did, as it was only a few years later that the automobile industry started in earnest. To-day, it is truly wonderful when it is known that some cylinders only 5/32-in. section are being made with 10 to 20 per cent steel and tested to 200 lb. At that time the losses on the cylinder head castings were exceedingly heavy, so much so that every foundry making them sustained large financial reverses.

After a long series of experiments it was finally decided to drop gray iron and turn our attention to

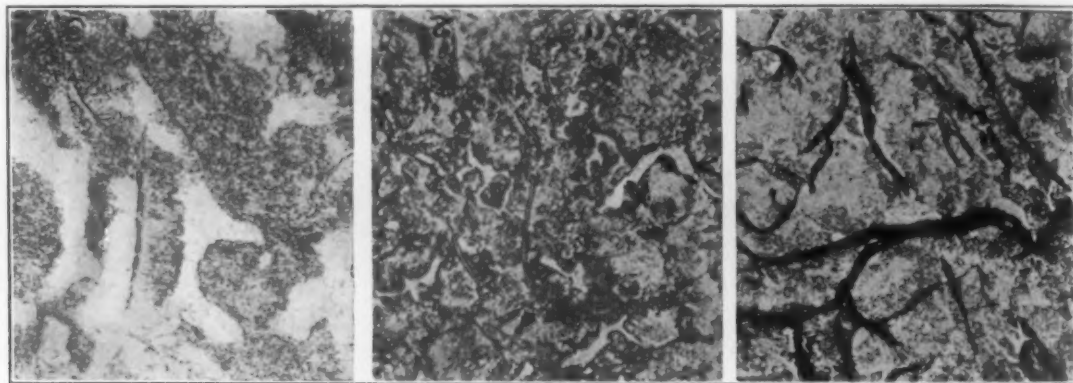


Fig. 1—Photomicrograph of Gray Iron, Showing Graphitic Carbon; Fig. 2, Structure of Large Piston Containing 35 Per Cent Steel; Fig. 3, Structure of Gray-Iron Cylinder

are continually demanding stronger metal, and lighter sections for castings that must stand higher tests.

## HISTORICAL FACTS

The aim of this discussion on semi-steel is to place before the members of this association and the foundry trade in general a few plain truths about it. Many of these statements deal with historical facts dating back 15 years. For 50 years or more, foundrymen have added steel to iron in the ladle, while comparatively few melted slight amounts of steel in the cupola, but up to 1902 or 1903 I could find no record of any man having used large percentages of steel in castings of light section.

Years ago I brought foundrymen from their own shops to see the steel charged in the cupola in a converter steel plant. They saw the metal coming from the cupola and yet remarked that you may be able to do this in the steel foundry, but you never could do it in the iron foundry.

In 1899, A. Christensen, the well-known inventor of the street railway air-brake, built a foundry to make gray-iron, steel and brass castings, of which plant I was superintendent for five and one-half years.

## A DIFFICULT CASTING

One pattern in particular, a cylinder head, had

the use of steel scrap. After 10 weeks' experimenting experts finally claimed the section should be increased, but Mr. Christensen would not accede to their wishes. Foundrymen advised that the pattern should be changed, but he would not listen to it, as he claimed: "When the metal was right, the castings were good." Later developments proved that he was correct.

From the start I believed that steel scrap in the mixture would enable us to close the grain of the metal, but the great danger was that the metal would be too low in carbon, as all leading authorities claimed that "steel reduces carbon."

## DOES STEEL REDUCE CARBON?

All textbooks, whether by technical or practical men, maintained that steel reduced carbon, that it was not a good thing to use as it caused "hard spots," that "a higher melting temperature was necessary," etc. Even to-day my claim that steel melts first puzzles some chemists, metallurgists and others, who evidently do not take into consideration that steel has a great affinity for the elements and absorbs a large quantity of carbon from the fuel.

The total carbon, as calculated, in the iron will remain practically the same, but as the steel content of the mixture will add to the total weight of the resultant metal without a corresponding gain in carbon, the total carbon, of course, will be less than if all iron had been used. That condition, however,

\*From a paper presented Sept. 15, 1916, at the American Foundrymen's Convention, Cleveland, Ohio.



does not exist when melting steel scientifically in the cupola. Steel in melting absorbs carbon from the fuel.

# COKE SAVINGS

To prove that less coke is required when melting steel, let me quote a few records made by progressive American foundrymen:

Daily Tonnage	Melting Ratio	Pounds Coke Required	Daily Saving, Pounds	Yearly Saving, Tons	Saved Per Year on Coke at		
					\$5	\$6	\$7
5	6 to 1 increase to 8 to 1	1,666					
15	6 to 1 increase to 9 to 1	1,250	416	62	\$310	\$372	\$434
30	7 to 1 increase to 10 to 1	3,333 8,571	1,667	250	1,250	1,500	1,750
		6,000	2,571	385	1,925	2,310	2,695

When melting 30 tons per day with coke at \$6 per ton, and you increase your melting ratio from 7 to 1 to 10 to 1, you realize a saving of \$2,310 per year, equal to interest at 6 per cent on \$38,500. John D. Rockefeller overlooked the foundry business.

# MANGANESE AS A SCAVENGER

I knew the value of manganese in steel castings

cupola. The resultant metal enabled us to make those very same castings that Mr. Christensen desired so much, with only 1 to 3 per cent loss, and our later experiments proved that steel scrap intelligently used was beneficial in all mixtures. Even 10 per cent increases the transverse strength of light castings from 25 to 35 per cent.

# 30 PER CENT INCREASED STRENGTH WITH 10 PER CENT STEEL

A concern in Michigan wanted stronger castings, but did not care to increase section nor weight, so they began using waste steel clippings with an increase in strength with only 10 per cent steel. The gray iron analyzed as follows: Silicon, 2.30 to 2.50 per cent; sulphur, 0.08 to 0.09 per cent; phosphorus, 0.75 to 0.85 per cent; manganese, 0.30 to 0.50 per cent. With 10 per cent steel the metal contained from 2.10 to 2.30 per cent silicon, 0.07 to 0.09 per cent sulphur, 0.60 to 0.70 per cent phosphorus, and 0.55 to 0.70 per cent manganese. The strength tests were as follows:

	Gray Iron, Lb.	10 Per Cent Steel, Lb.	Percentages in Favor of 10 Per Cent Steel
Average transverse strength.	2,252	2,900	28.7
Minimum transverse strength.	2,180	2,760	26.6
Maximum transverse strength.	2,310	3,020	30.7

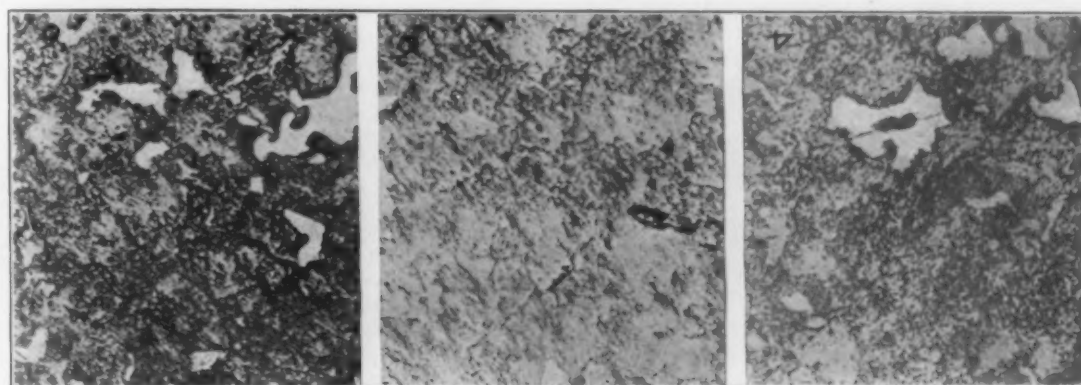


Fig. 4—Photomicrograph of Semi-Steel Containing 30 Per Cent Steel; Fig. 5, Structure of Semi-Steel Test Bar Having a Transverse Strength of 3460 Lb.; Fig. 6, Structure of a Bushing Containing 50 Per Cent Steel

and wanted to use it for semi-steel castings—a higher manganese content than was found in the ordinary pig. I believed it should be melted in the cupola and I succeeded in doing it.

Iron, steel and manganese have a great affinity for sulphur, but as manganese has more of an affinity for oxygen than for iron, it has a tendency to leave the iron and will attract a percentage of sulphur, forming a manganese sulphide, some of which passes off in the slag. The amount of sulphur expelled from the metal will depend on the amount of manganese, the nature of the slag-forming elements, and the temperature at which the metal is melted. If both manganese and sulphur are high in the casting, have no fear of the sulphur, as it will be neutralized by the manganese.

At the time I began experimenting with semi-steel it was generally believed that manganese hardened castings when above 0.85 per cent because of the accepted theory that manganese converts graphitic carbon to combined carbon. But as silicon converts combined carbon to graphitic carbon, it was not mentioned what the percentage of silicon was when manganese hardened iron.

It was impossible to secure any reliable data on the percentage of manganese which should be used, and as our local blast furnace made no pig with more than 0.70 to 1.00 per cent manganese, I purchased a few tons of 80 per cent ferromanganese in lump form to add to the charge going into the

# ENDURANCE OF SEMI-STEEL

Semi-steel is believed to be a great heat and acid resisting metal, because the metal is purer than gray-iron. In recent fire tests of gray-iron and semi-steel castings, to learn which is preferable, the gray iron lost 34 per cent by weight, while the semi-steel only lost 9 per cent. Even the despised grate bar is in a higher class than formerly, and railroads are eager for semi-steel grate bars, as tests have demonstrated that one set of semi-steel grate bars stands up better than three sets of gray-iron bars.

Gears and gear blanks made of semi-steel frequently will outwear steel gears. The high graphitic carbon in semi-steel acts as a lubricant, a feature not possible in steel castings. Many concerns who formerly made all their gears of steel are now making them of semi-steel. Acid castings, air, gas, water and steam engine castings, ammonia fittings, crane wheels, cross heads, gears, gear blanks, grate bars, glass house molds, jig castings, lathe beds, locomotive parts, machinery castings, Diesel engine parts and valves, are improved when 30 per cent steel or more is used.

# MICROPHOTOGRAPHS AND ANALYSES

Fig. 1 is a micrograph of gray iron. You will note the large black carbon flakes. These flakes break up the structure of the metal, thus making



it brittle and weak. The gray substance is carbon, combined with iron, forming steel, while the white is iron. The analysis is as follows: Graphitic carbon, 3.15 per cent; combined carbon, 0.15 per cent; silicon, 1.85 per cent; sulphur, 0.098 per cent; phosphorus, 0.402 per cent; manganese, 0.50 per cent. Fig. 3 is a specimen from a small gas-engine cylinder made of gray iron, that nearly put the maker out of business. The manager of the foundry did not believe in the use of steel, but when the firm became converted he graciously consented to follow instructions and in a few weeks the loss was reduced to 2 and 3 per cent as against 20 and 30 per cent previously. Fig. 2 is a sample of semi-steel in which you will note the graphic carbon flakes

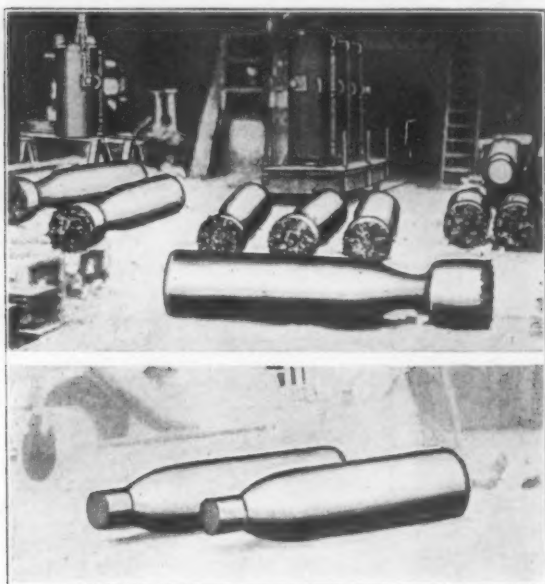


Fig. 7—Finished and Unfinished Semi-Steel Shell Castings

are exceedingly small. The gray constituent is steel and the small white particles are ferrite or iron.

#### CLASSIFICATION OF SEMI-STEEL

The writer believes the following classifications, with analyses, have proved best by actual test for semi-steel castings:

Automobile cylinders, pistons and other light castings, 3/16-in. to 3/8-in. section with 10 to 20 per cent steel; silicon, 1.90 to 2.25 per cent; sulphur, 0.07 to 0.1 per cent; phosphorus, 0.35 to 0.55 per cent; manganese, 0.65 to 1 per cent. Packing rings, gas engine cylinders and automobile cylinders, 3/8-in. to 1/2-in. sections, with 15 to 25 per cent steel, silicon, 1.65 to 2 per cent; sulphur, 0.07 to 0.1 per cent; phosphorus, 0.35 to 0.55 per cent; manganese, 0.65 to 1 per cent.

Fig. 4 is a photomicrograph of a specimen of semi-steel containing 30 per cent steel; Fig. 5 is a specimen containing 40 per cent steel, and Fig. 6 is a specimen containing 50 per cent steel.

#### PROJECTILES OF SEMI-STEEL

While both large and small projectiles are being made of semi-steel "somewhere on the continent" and quite a few places in America, still technical men will hardly credit this statement. Fig. 7 shows several 12-in. projectiles which weigh 1200 lb. net and 1600 lb. gross. Thousands of these have been made in America. The illustration also shows the same projectiles with the risers turned off. They are shipped in this form and are finished by the purchaser.

#### HARDENING SEMI-STEEL

An Easten firm objected to the high cost of

the die steel used in its forge shop and someone suggested semi-steel. The foundry superintendent was called on and he agreed to make some semi-steel bars, which he thought could be hardened. They first tried it on a few punches for hot work, but it was either too soft or too hard, until they hit on the right process of hardening. The writer does not claim that semi-steel will replace tool steel. The concern just referred to no longer buys steel for making dies, as semi-steel wears better, is easier to machine and is much cheaper.

#### A CHEMIST'S OPINION

A letter addressed to the writer by C. J. Atkinson, Milwaukee, a chemist and metallurgist who has handled thousands of semi-steel samples, and dated July 19, 1916, is as follows:

The series of micrographs and chemical analyses I have made for you of semi-steel and ordinary gray cast iron are exceedingly interesting in several ways. The difference between semi-steel and gray cast iron is particularly noticeable in the formation of the graphitic carbon. In cast iron where there is a large mass of metal, the graphitic carbon is always found in large flakes, whereas with the semi-steel the graphitic carbon is in exceedingly small flakes and in small granules.

Another feature is the high sulphur content of these steels. If this had been cast iron with this high sulphur, they would have been exceedingly hard because sulphur has a tendency to promote chill.

Another factor is that in none of the samples have I found any blow-holes or microscopic cavities. The material appears to be exceedingly close.

In nearly all the samples examined, the combined carbon content was high. This, of course, is due largely to the high sulphur; in all cases with the exception of two which showed chill, the material is easy to machine.

The various metallographic elements in the construction of all these irons are as follows:

Pearlite which appears under the microscope or in the photograph as a dark substance, laminated or speckled under high magnification is really iron saturated with carbon, forming steel. Graphitic carbon appears under the microscope as black specks or lines. In most of the photographs, though, these cannot be easily detected, as they are more or less obscured by the pearlite.

The white or light colored areas which contain some slight specks or markings are ferrite, which can be described as iron containing a certain amount of impurities. In one or two of the samples there is another white substance which is absolutely structureless. This is cementite, which is a very hard, brittle substance. It is composed of iron containing a large amount of combined carbon. It is only found in those castings that have been chilled.

Another feature that is extraordinary is the uniformity of this series. Although the castings were of exceedingly varying weights, some having very thick sections and others being exceedingly thin, the metal microscopically was exceedingly uniform, much more so than you would expect to find in gray iron, as we know that where the section of a casting is light there is a tendency for the iron to be exceedingly hard and brittle unless the chemical composition is modified to suit the weight of the casting.

Excellent pig iron is reported to have been recently made at a new plant in New Zealand from large deposits of iron, much of it being found in iron sand at Taranaki, near New Plymouth, on North Island. Pig iron was produced there in commercial quantities as early as 1848, and some of it is said to be of a very high quality as judged by tests made in England. The cost of production is placed at \$11.49 per ton, which could probably be reduced by up-to-date equipment. Coal is found in the vicinity. Imports of pig iron into New Zealand in 1914 were 10,805 tons, valued at \$225,567, of which the United States supplied 85 tons and the United Kingdom 9284 tons.

## STEEL CASTING SPECIFICATIONS

### Report of the Committee of the American Foundrymen's Association

On taking up the work of this committee, your chairman, acting in co-operation with your president, R. A. Bull, enlarged the committee by the addition of several members. A copy of the last report of the committee, giving recommendations for changes in the standard specifications for steel castings, published by the American Society for Testing Materials, was sent to each member of the committee, with the request that he give his opinion on the proposed changes, point by point.

With this information in hand, your chairman held a conference with Mr. Thomas, the chairman of the Steel Founders' Society committee on steel castings, who was provided with the views of the members of his committee on the proposed changes. Your chairman and Mr. Thomas then requested committee A-1 of the American Society for Testing Materials to call a meeting of its sub-committee on specifications for steel castings to consider these changes. Your chairman and Mr. Thomas attended this committee meeting, and did their best to secure the adoption of such changes as met the views of the majority of the two committees.

The changes secured were acted upon favorably by the full committee A-1 of the American Society for Testing Materials, and at the recent convention of that society these changes in the specifications were approved and referred to the membership of the society for letter ballot. When the result of the letter ballot is ascertained, these changes will be finally accepted or rejected.

The wording of Section 5-D was changed from its old form to the following form:

Class B castings shall be properly annealed, the treatment depending upon the design and chemical composition of the castings.

The changes proposed in section 6, as embodied in the former report of this committee, were not satisfactory to the majority of the members of the committee as now constituted, nor were they satisfactory to the membership of the Steel Founders' Society committee. After somewhat protracted discussion at the meeting of the sub-committee on steel castings of the American Society for Testing Materials, it was voted to leave this section and Section 23 in their present form.

The change proposed in Section 7, to add silicon to the list of the elements to be analyzed, was not satisfactory to the membership of your committee, nor to that of the Steel Founders' Society committee, and we did not recommend any action on this to the American Society for Testing Materials.

#### PHYSICAL TESTS AND ANNEALING

The changes proposed in Section 9-A with reference to physical properties and tests of Class B castings were satisfactory to the membership of both committees. Your chairman regrets to state, however, that the American Society for Testing Materials took action on only one-half of these recommendations. Their action was to specify that the elastic limit, or rather the yield point, for all grades of castings should be 45 per cent of the tensile strength. The efforts to have them specify that the percentage of elongation in 2 in. shall equal 1,400,000 divided by the tensile strength per square inch failed, and no action was taken on this recommendation.

Section 11 has been amended to read as follows:

In the case of small or unimportant castings, a test to destruction on three (3) castings from a lot may, upon agreement between the manufacturer and the purchaser, be substituted for the tension and bend tests. This test shall show the material to be ductile, free from injurious defects, and suitable for the purpose intended. Unless otherwise agreed upon between the manufacturer and the purchaser, a lot shall consist of all castings from one melt, in the same annealing charge.

The addition proposed to Section 12 was to read as follows:

When desired by the purchaser suitable test lugs shall be cast on castings which do not have test bars attached, so that the inspector may judge of the annealing.

This proposed addition was not satisfactory to the membership of your committee, nor to that of the Steel Founders' Society. Certain members of the sub-committee on steel castings of the American Society for Testing Materials were anxious that this addition should be made, and the action that was finally taken at the meeting of their committee was the appointing of a sub-committee of their sub-committee on steel castings to report next year on the advisability of this step. At present no action has been taken.

#### TURNED OR THREADED GRIPS

The change proposed in Section 12-C—"Or have turned grips at the option of the manufacturer" which was desired by the membership of both committees in order to legitimize the use of test bars with plain turned ends, was taken care of by the action of committee A-1 of the American Society for Testing Materials in changing their specification for test bars to allow either a threaded end test bar or a test bar with plain turned end. This change applies to all their specifications for steel. The full text of their new specification is as follows:

Tension test specimen shall conform to the essential dimensions shown in Fig. 2. They shall have filleted shoulders, or threaded ends, to fit into the holders on the testing machine in such a way that the line of action of the force exerted by the testing machine shall coincide with the axis of the specimen.

A new section, No. 14, has been inserted following Section 13. This section reads as follows:

If the results of the physical tests of any test lot do not conform to the requirements specified, the manufacturer may re-anneal such lot not more than twice, and re-test shall be made as specified in Sections 9 and 10.

A slight change has been made in Section 15-C which now reads as follows:

Castings shall not be offered for inspection if covered with paint, rust, or any other substance to such an extent as to hide defects.

#### THE QUESTION OF SULPHUR

Your chairman regrets the inability to secure action at this time changing the allowance for sulphur in castings, but feels that this matter will take care of itself in the immediate future, and that within a year or two action upon this point will probably be forced by the pressure of circumstances. He regrets also that the American Society for Testing Materials was unwilling to change its specifications for elongation as requested by this society, but in general he feels that the changes secured are sufficiently satisfactory to warrant him in recommending that the American Foundrymen's Association use the specifications of the American Society for Testing Materials as now amended rather than endeavoring to get up specifications of its own.

The report was signed by John Howe Hall, chairman; W. C. Hamilton, A. H. Jameson and Arthur Simonson.

The Louisville Industrial Foundation, Louisville, Ky., which will administer the factory fund of \$1,000,000 recently subscribed, has organized with Lewis R. Atwood, president; Donald McDonald and William Heyburn, vice-presidents; William E. Morrow, secretary, and Victor H. Englehard, treasurer. The first payment on subscriptions, 10 per cent, has been called for Oct. 1, and the organization will at once begin negotiations with manufacturers wishing to locate at Louisville. W. E. Caldwell, president W. E. Caldwell Company, and Charles F. Huhlein, president B. F. Avery & Sons, are on the committee to investigate applications.

Technological paper No. 78 of the U. S. Bureau of Standards offers the results of an investigation to show what part the three principal constituents of Portland cement—tricalcium silicate, dicalcium silicate and tricalcium aluminate—play in developing the physical properties of this material.





cases, be governed by the number of castings to be made from different patterns.

Those machines which are simple and permit of easily changed patterns offer more value to ordinary shops. Among such machines are the ordinary hand or air squeezer, the simple roll-over drop plate, and the straight stripping plate machine. Very few foundries are doing work of such a nature but that it will pay them to investigate the possibilities of installing some of the simpler molding machines. In foundries having exceedingly large orders, the more complicated machines that combine several operations and the installation of elaborate sand handling plants are important factors.

Nearly every shop will find that it pays to have simple electric riddlers and sand mixers in labor. The use of these mixers will assist the foundryman in standardizing his methods of mixing.

UNIFORMITY DESIRABLE

Where possible, the make of machines should be kept as uniform as possible, for this means fewer kinds of pattern fixtures, greater interchangeability of work and all machines in use all the time.

Another important item to consider in foundry equipment is that of flasks. In only a few cases do the old wooden flasks pay, for their weakness and short life make them the most expensive in common use. The foundry management must decide whether it wants steel, iron or wood flasks, and careful consideration should be given to finding out what is best for any particular shop. The question of investment, absolute accuracy of flasks, ease in handling, standardization of pins, and length of service are some of the things to be considered.

MAINTENANCE

Upkeep of equipment is just as important as its proper selection. One man should be put in charge of

STANDARD TOOL LIST 1-1			
INSTRUCTION CARD NO. D1			
	Rack	Sec	Shelf
Set Std. floor tools	2	D	43
20 Wedges	1	A	6-24
2 Gate pins 30"	2	D	42
3 Riser pins 4x20"	1	B	30
20 d. spikes	2	C	15
1 lb. 3d nails	2	C	18
4.8" Roll-over clamps	4		3
6. 24" Clamps	4		5

Fig. 3—The Tools Required for a Given Job

this work, and should be held responsible for results. A tool room will form a valuable adjunct to every foundry and will eliminate the constant hunting for such tools as levels, hatchets, trammel points, special clamps, gagers and many times for decent riddlers, rammers, shovels and many of the most commonly used tools.

With a central storage place, tools and equipment can be kept in repair and on hand in sufficient quantity for the needs of the shop. When a workman is through with special equipment, such as gagers, clamps, riser pins, blocks, etc., it should be returned by someone whose duty is to collect such things. Other tools, such as the more valuable special lifters, wrenches, levels, hammers, etc., could be checked out on the ordinary checking system.

Even in highly specialized shops there is need of this central tool room together with supervision over the tools used, for very few molders really analyze their needs to the best advantage. Much time could be saved if all the workmen were supplied with the best small tools for their class of work, for there are few foundries in the country where there is not seen a great variety of swab pots, lifters, slicks, vent wires, gate cutters, draw screws, etc. In this large variety of tools there are many which are inefficient and should be discarded.

It is becoming more and more impressed on foundrymen that before a piece of work is turned over to the workmen, it should be carefully considered by a planning department to see that the proper flasks, boards, rods, gate and riser pins, facing sands and methods of making are placed in the hands of the molder before he starts to work. This idea may be carried out further by having this information placed on a form and filed

C1

INSTRUCTION CARD

1-1

FORM NO.

SHIP LABORATORIES

FOUNDRY DEPARTMENT

PARTY

CRANKCASE CORE

ARTICLE Gas Engine

PATT. NO. 1-1

FLOOR

BENCH

GOLF

MACHINE

STATION

STANDARD FLASK NO.

SPECIAL FLASK NO.

CORE BOX NO. 2

SAND MIXTURE NO. 3

WIRE, SIZE

NO. LONGER FOR

CORE PLATE NO. 10

NO. CORES 1

TOOL KIT NO. 2

RAMMER

PACING SET NO.

PACKING SET NO.

Gate stick N°1

Gate stick N°2

Fig 1

Fig 2

Fig 3

ITEM	OPERATION ROUTINE	STANDARD TIME
NOTE: MECHANICAL ASSISTANTS.		
4 GALLONS SAND MIXTURE NO. 5, AND 1 CORE PLATE NO. 10 FOR EACH CORE TO BE MADE, MUST BE PREPARED IN ADVANCE OF ISSUING WORK ORDER.		
CORE BOX AND RODS TO BE AT ASSIGNED ROOM, LISTED TICKET TO BE CALLED FOR BY WORKMAN AT TOOL ROOM WINDOW.		
1.	CLEAN INSIDE OF BOX WITH OIL WASTE. SET BOX ON STANDS.	0.004
2.	FILL IN A 4" LAYER OF SAND. SET GATE STICK NO. 1 (SPEC. 2, 1-1) (RAM AND FEEL)	0.012
3.	FILL IN A 2" LAYER OF SAND AND FEEL RAM.	0.009
4.	SET 8 RODS AS SHOWN. FIG. 1A. THE POINT OF THE RODS SHOULD ALMOST TOUCH BOTTOM OF BOX AND SHAKE SHOULD PROJECT OVER FLANGE OF BOX AS AT A. FIG. 1.	0.014
5.	SET GATE STICK NO. 2 (SPEC. 2, 1-1)	0.008
6.	FILL BOX 1" ABOVE TOP AND SET LIFTING HOOK AS AT B.	0.012
7.	ROTT DAM AND STRIKE OFF LEVEL WITH TOP OF BOX.	0.002
8.	REMOVE GATE STICKS. UNCOVER TOP OF LIFTING HOOK.	0.004
9.	LAY CORE PLATE ON BOX. CLAMP PLATE TO BOX.	0.010
10.	ROLL BOX OVER ON STAND. REMOVE CLAMPS.	0.008
11.	RAP CORE BOX AND LIFT AWAY FROM CORE.	0.006
12.	PLACE CORE ON OVER TRUCK.	0.004
NOTE: FEEL THROUGH WITH ORDER CLEAN BOX AND RETURN TICKET TO TOOL ROOM.		
TOTAL STANDARD TIME		0.11

Fig. 4—Special Information Is Detailed by the Written Routine, with Sketches. Such an Instruction Card Prevents Spoiled Parts and a Waste of Effort

away for future use. This record will be of invaluable assistance to those having charge of the planning in the shop. Fig. 3 illustrates such a tool card as can be used to advantage by any foundry. Fig. 6 shows an illustration of an instruction card for use in core-making and core-molding.

Safety Devices Must Be Approved by Pennsylvania Board

A list of safety devices that meet every requirement of State laws and safety standards is being established by the Industrial Board of the Department of Labor and Industry, Harrisburg, Pa. For the purpose of passing on such devices that may be submitted for approval, the Industrial Board has created an approvals committee consisting of two members of the board, the engineers and physicians of the division of hygiene, the safety engineer of the department and the chief of the bureau of inspection. Manufacturers of safety equipment who desire to receive the approval of the State may submit their devices at the regular meeting of the approvals committee on the last Wednesday of each month. Every device must be submitted separately and the application must be accompanied by the device itself or a working model of it and an 8 x 10 in. unmounted photograph and a copy of the Underwriters' Laboratories approval if it has been presented to those laboratories.

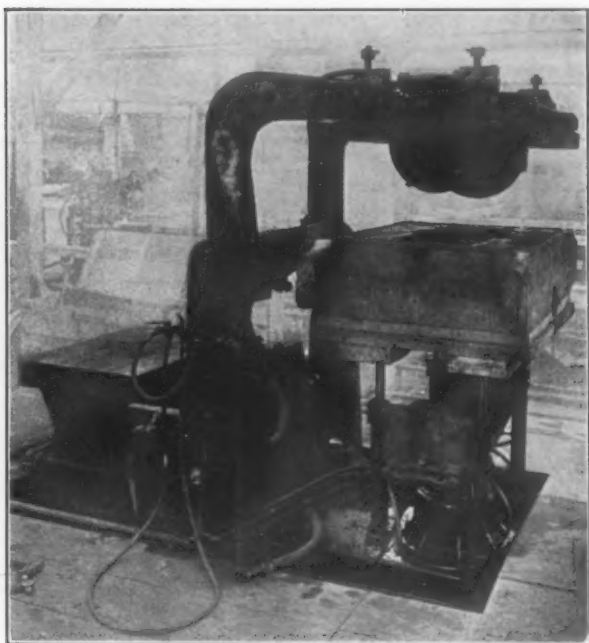
The Gulf States Steel Company's net earnings for August, after allowing for depreciation and heavy reserves, were \$237,483, the largest in the history of the company, being an increase of \$186,914 over August, 1915, and \$35,441 over July of this year. For the eight months to Sept. 1 net earnings amounted to \$1,380,916, as against \$318,719 for the same period in 1915.



## NEW MUMFORD MACHINE

### Jolt Roll-Over Draw Molding Machine Shown at the Cleveland Exposition

One of the interesting working exhibits at the show in connection with the recent convention of the American Foundrymen's Association in Cleveland, Ohio, was a new jolt roll-over draw molding machine built by the E. H. Mumford Company, Elizabeth, N. J. This machine is designed for a large range of work, taking a



Jolt Roll-Over Draw Molding Machine Taking a 37 x 48-In. Flask

37 x 48 in. flask and having a 16-in. draw. The operation of the machine is as follows:

The pattern board is placed directly on the jolt rammer table by means of a positive spring locking device, thus doing away with the usual floating plate arrangement. The filled flask is rammed by means of a Mumford standard jolt rammer having a 10-in. cylinder and a capacity of ramming at 80 lb. pressure half molds weighing 3700 lb. The mold is then clamped to the pattern board, and the rock-over valve is opened. As soon as the roll-over arms start upward in the rolling over operation, they are automatically locked to the pattern board by means of sliding pins. This locking takes place as soon as the arms move upward  $\frac{1}{4}$  in., so that all danger of the pattern board slipping, it is claimed, is eliminated. The rolling over operation is effected by means of a 16-in. air cylinder acting on a crank.

When the mold is rolled over it hangs suspended by the arms over the levelling and pattern drawing device, this device being a Mumford fluid pressure plunger similar to that used on the Mumford split pattern machine for drawing the patterns. In operation the draw plunger raises the levelling device to a height of 16 in., the maximum draft, when a stud opens a pop valve, releasing four levelling pins which raise until they strike the bottom of the flask. As the levelling pins operate independently of each other any inequality in the surface of the board is automatically taken up. The pins are 22 in. in length, so that no adjustment is necessary for shallow or deep flasks and a saving in time is effected when molds of various depths are being made. When the pins have come to rest under the bottom board they are locked by means of an air clamp. This clamp exerts a pressure of 3 tons on each separate pin, thus assuring a rigid rest for the flask. It may be seen from the above that hand levers for locking the pattern board to the arms and also for locking the levelling devices have been entirely done away with.

When the flask has been levelled the pattern is drawn by means of a fluid pressure plunger. The oil in the cylinder passes through a small outlet to let the plunger down and the plunger is claimed to insure an even draft under all conditions. The machine is operated by means of five valves, and these are placed in consecutive order so that passing from an operation to the next is easily indicated by their location and it is not necessary for the operator to move from one position to complete every operation.

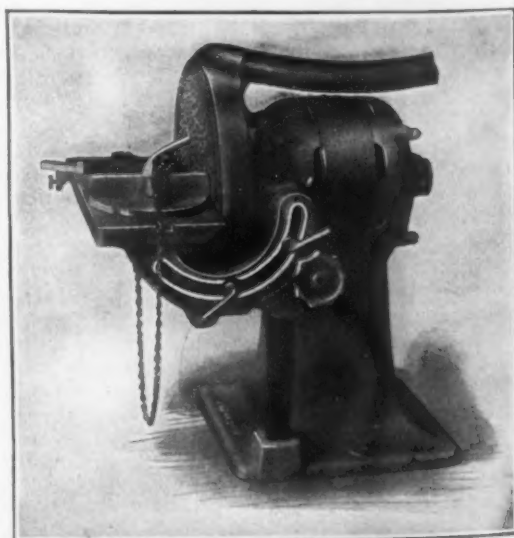
### Vacuum-Cleaner Disk Grinding Machine

A motor-driven bench type disk grinding machine equipped with a self-contained vacuum dust removing system has been placed on the market by the Pioneer Dustless Disc Company, Syracuse, N. Y. The machine, which is readily portable, was designed especially for use in metal or wood pattern shops, but can also be used for any small parts that can be handled on this type of machine.

The grinding disk is 9 in. in diameter and is readily removable from the shaft, so that new paper or cloth abrasive disks may be glued in place. Aluminum is employed for the disk and the small diameter, it is pointed out, permits standard sized sheets of garnet paper to be used. The back of this disk is fan-shaped and the guard which incloses the entire back and the lower portion of the front, it is explained, forms a complete exhaust fan which is relied upon to prevent accumulations of dust on the work. The exhaust pipe connected with the dust removal system discharges into a sack or else out of doors. A 1/16-hp. motor arranged to take its supply of current from a lamp socket drives the disk and a ball thrust bearing is provided to guard against end thrust.

The table, which measures  $4\frac{1}{2}$  x  $11\frac{1}{2}$  in., will tilt to any angle between 20 deg. above the horizontal and 45 deg. below. This adjustment is controlled by a circular rack and pinion operated by a handwheel, and a graduated gage enables the table to be set to any desired angle and then locked in position by thumb screws. A vertical adjustment is provided to enable the disks to be removed when the table is lowered. Angle and centering gages arranged to slide in a slot in the table are provided. The former is of the protractor type and has an adjustment for grinding the ends of segments or any other angular face. The centering gage is provided with holes to receive small steel centers and an adjusting screw is also supplied for use where core prints, bosses, etc., ranging from  $\frac{3}{4}$  to 8 in. in diameter are to be ground.

The weight of the entire machine is 55 lb. which renders it readily portable. The base of the machine is 9 in. square and the over-all height is 15 in.

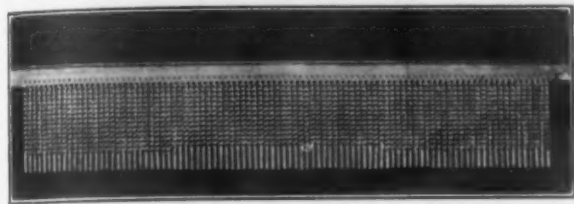


In this Bench Type of Disk Grinding Machine a Self-Contained Vacuum System is Employed to Remove the Dust

### Special Chain Screen Door for Furnaces

An interesting type of chain screen door for furnaces has been added to its line by the E. J. Codd Company, 700 South Caroline Street, Baltimore, Md. For some time this company has been manufacturing a line of chain screen doors for oven, furnace and boiler openings, and the new one is intended for furnaces that are charged and discharged with tongs.

The chain screen door as generally installed consists of a number of freely hanging individual strands of steel chain suspended from a steel bar to form a continuous sheet or curtain of chain that is very similar to the bamboo Japanese screen. It is explained that this curtain hanging before the uncovered opening to a furnace prevents the heat, glare, gases and sparks from leaving the furnace and the cold air from entering,



A Chain Screen Door for Furnaces That Are Charged and Discharged by Tongs and Having the Lower Ends of the Chain Terminating in Short Tubes to Guard Against Catching in the Crotch of the Tongs

while the loosely hanging strands of light chain can be parted readily by tools or other objects projecting into the furnace and fall together again when entrance has been effected. The holes in the links of the chain, it is pointed out, do not interfere with the view of the interior and in fact the glare is toned down, giving an effect somewhat similar to looking into the furnace through a piece of wire gauze. The use of this screen also enables the workman to have both hands available for work instead of using a shield in one hand while the tools are manipulated with the other. Among the uses to which these screens are put are on furnaces for treating glass, steel, iron, copper, zinc and chemicals, billet and shrapnel furnaces, steel soaking pits, roasters for pyrites and in cement works.

This new form of screen was developed for use in plants where the furnaces are charged and discharged by tongs and was designed to overcome the catching of the chains in the crotch of the tongs. The screen consists of a standard chain type with short pieces of light tubing attached to the bottom of each strand, the length of the tubes being approximately one-half the height of the opening of the furnace. It will be noticed that the tubes are of two different lengths which is due to the arch of the furnace being higher in the middle than at the ends. This screen is of the non-automatic type in which a hand chain running through an overhead pulley is employed to lift it out of the way.

In addition to this type of screen for oven and furnace openings, an automatic screen door is made for use on boilers where the opening of the firedoor causes the screen to unroll from a cylinder hung above the opening.

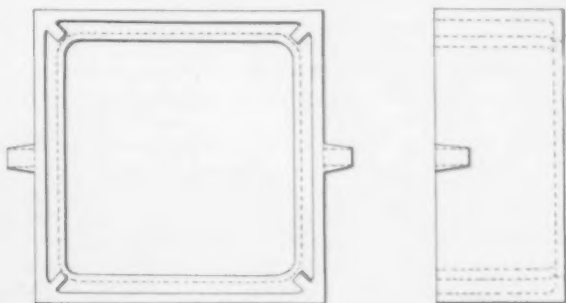
### An 18-In. Hollingworth Engine Lathe

A large-diameter hole through the spindle and a heavy bed are the distinguishing features of a new 18-in. engine lathe that has been brought out by the Hollingworth Machine Tool Company, Covington, Ky. The spindle has a hole  $1\frac{7}{16}$  in. in diameter, extending entirely through it, and the speeds range from 9 to 468 r.p.m. The bed weighs 2550 lb. and in spite of this unusual weight the design is symmetrical.

Within 90 days the new Sun Shipbuilding Company, Chester, Pa., will be ready to begin the construction of vessels. The finishing touches are being put on the main building, 506 x 880 ft., which will contain a mold loft and laying-out department. Concrete piles for four of the five 600-ft. shipways have been placed and the concrete foundations are being laid for the large cranes.

### A Hot Top for Ingots

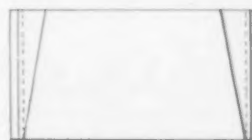
A hot top for ingots, which has been in actual service at the Cambria Steel Company, Johnstown, Pa., for over three years, is an invention of D. D. Buchanan of the open-hearth department of that company, covered by U. S. Patent No. 1,181,209. The one iron casting required is made with lifting



PLAN AND SECTION  
OF IRON  
CASTING



PLAN AND SECTION  
OF SPECIAL  
BRICKS



lugs for convenience in crane handling, as shown. Four firebricks with beveled ends are used to line the casting and unskilled labor is employed in fitting up. The special bricks used are also shown in the illustration. The life of the iron casting averages over 100 heats, while one lining of bricks is reported good for a minimum of 15 heats.

This form of top overcomes the disadvantage of having a projection extending down into the mold and eliminates all tendency of the ingot to hang. It is not necessary to allow the hot top to cool down, as it can be transferred to another mold and is ready for immediate use.

### Lubrication Record of a Poppet Valve Engine

Lubricating 512,840 sq. ft. at a cost of 1c. was the record established for a 20 x 32-in. Norberg poppet valve engine installed in the plant of the Rockwell Mfg. Company, Milwaukee, Wis. This figure was made in July of this year when the engine ran 224½ hr. at a speed of 150 r.p.m. In this period 2 gal. of cylinder oil was used and the total cost of lubrication was \$1.10. The area of the cylinder swept by the piston rings at each revolution was 27.92 sq. ft. and the total surface swept in the month was 56,412,360 sq. ft. The engine used superheated steam at a gage pressure of 150 lb. and a superheat of 120 deg.

A standard 48-in. engine lathe is being placed on the market by R. H. Kiddle, Kinsman, Ohio. This lathe is equipped with a duplex feed, but otherwise has the usual features of construction and standard adjustments.



## FOUNDRY SANITATION

### American Foundrymen's Association Code Recommended at Recent Convention

At the meeting of the American Foundrymen's Association held in Cleveland, Sept. 11 to 15, the committee on safety and sanitation, of which Victor T. Noonan, of the Industrial Commission of Ohio, is chairman, submitted a safety code for foundries. The code covers the subjects of entrances, gangways and aisles, ventilation, lighting, heating, sanitation, core rooms, cleaning and finishing operations, equipment, inspection and employment of females.

The code provides that all entrances to foundries, except those for locomotives, cranes or horse-drawn or motor vehicles shall be vestibuled. The regulations governing gangways and aisles are chiefly concerned with the width necessary to provide clearance for the passage of ladles. In main gangways a side clearance of 6 in. on each side is required for two hand or buggy ladles passing in opposite directions. Crane ladles are given a clearance of 18 in. on each side. The code also calls for the keeping of aisles free from pools of water and all obstructions during pouring time.

#### VENTILATION, LIGHTING AND HEATING

The rules for ventilating and lighting are less specific. They call for sufficient natural or forced circulation of air to render harmless the smoke, gases and fumes. No standard is given to show what dilution of fumes may be considered harmless. The ventilation rules also provide for the drying of ladles under hoods, and also for the provision of hoods over all ovens and furnaces.

In regard to lighting, the rules are equally vague. They simply call for sufficient natural and artificial light to provide safe entrance and exit, and to enable the work to be carried on safely during working hours. As no standard of what may be considered good illumination is given, each foundry man must be the judge of what constitutes "sufficient light."

The code is definite in regard to heating. It calls for the maintenance of a minimum temperature of 50 deg. F., and prohibits the use of open salamander stoves.

#### SANITATION

The question of sanitation has been carefully considered and the sanitary provision necessary in foundries of different sizes are shown in the following table:

Water Closets		
Number of Persons	Number of Closets	Ratio
1 to 10.....	1	1 for 10
11 to 25.....	2	1 for 12½
26 to 50.....	3	1 for 16⅔
51 to 80.....	4	1 for 20
81 to 125.....	5	1 for 25

Urinals		
Number of Persons	Number of Urinals	Ratio
1 to 30.....	1	1 to 30
31 to 80.....	2	1 to 40
81 to 160.....	3	1 to 53⅓

Washrooms		
Number of Persons	Number of Wash Basins	Ratio
1 to 8.....	1	1 for 8
9 to 16.....	2	1 for 8
17 to 30.....	3	1 for 10
31 to 45.....	4	1 for 11½
46 to 65.....	5	1 for 13

Shower Baths		
Number of Persons	Number of Showers	Ratio
1 to 50.....	1	1 for 50
51 to 100.....	2	1 for 50
100 to 200.....	3	1 for 66⅔
200 to 400.....	4	1 for 100

The sanitary code also calls for individual metal lockers, and for provision for drying the workers' clothes. Common drinking cups are prohibited, drinking fountains being substituted.

#### CORE AND CLEANING ROOMS

The provisions of the code relating to core rooms repeat the sanitary requirements for the foundry proper, and also limit the temperature of the room in which cores can be made when the core ovens are in the cores handled by them to 110 deg. Fahr.

The code also provides separate working spaces for female core makers, and limits the temperature of same room as the core makers to 100 deg. Fahr.

Exhaust apparatus is required around dry tumbling mills, grinding, buffing and polishing wheels. Screens and guards to protect both the operator and adjacent workmen are to be provided at abrasive wheels, and swing frame and portable grinders. Sand blasting is to be carried on in sand blast rooms and helmets or masks, respirators, goggles, etc., are required for the workers. Similar equipment is called for other workers whose duties are such as to make it desirable. Other provisions of this portion of the code relate to the screening and guarding of chipping places and benches, the guarding of casting-breaking drops, the enclosing of arc-welding apparatus and the provision of suitable tools.

#### GENERAL EQUIPMENT

In the section devoted to equipment, the code requires the guarding of pits and openings in the foundry floor. It also specifies worm geared tilting devices for ladles of 2000 lb. capacity or over, and provides that crane, truck and trolley ladles shall have their center of gravity below the trunnions and have clips to prevent them overturning. Sheet metal guards must be provided on single shank hand ladles.

Specifications are also given for the construction and guarding of platforms around upright crucible furnaces which project over 12 in. above the surrounding floor.

#### New Line of Motor-Driven Grinding Machines

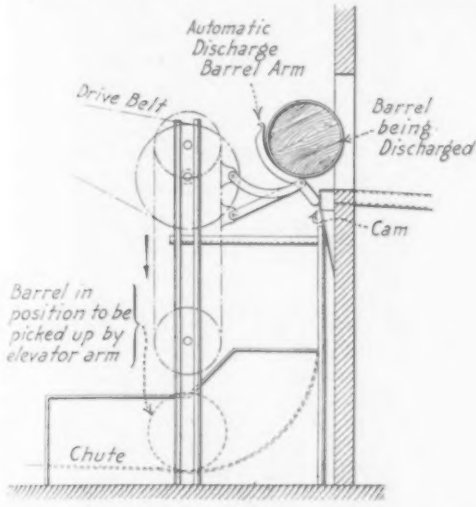
Larger sizes of bench and floor electric grinding machines have been developed by the Hisey-Wolf Machine Company, Cincinnati, Ohio. They are driven by motors ranging from ½ to 5 hp. that are wound for use on direct or alternating current circuits. Quick-acting switches are provided for all machines and the larger sizes have automatic starting equipment. The operating handle is conveniently located in front of the motor and the switch is entirely inclosed in the base, an arrangement which provides protection and at the same time renders the mechanism readily accessible. Ball bearings mounted in the motor end caps close to the grinding wheels are provided for all the machines and felt protection washers placed on each side of the bearing housings are relied upon to exclude dust and grit. Guards covering three-fourths of the circumference of the wheels are supplied and connections for a blower system are provided. Baffle plates are furnished to prevent broken wheel parts and sparks from escaping and a hinged door with a lock is supplied to facilitate the renewal of the wheel without removing the guard. A sliding door enables the particles produced in grinding to be removed where some sort of dust removal system is not employed.

Cash prizes for papers on one of three subjects have been announced by the Engineers' Subdivision of the Chicago Association of Commerce, 10 South La Salle Street, Chicago. The contest is open to undergraduates, and 1915 and 1916 graduates of engineering schools in the United States. The papers are not to exceed 3000 words in length, and the subjects suggested are as follows: "Engineering and Civic Progress," "The Engineer of the Future," and "The Business Relation of the Engineer to the Commercial World." Three prizes, \$50, \$30 and \$20 respectively, are offered, and the papers are to be mailed to the Engineers' Subdivision Contest, at the address stated, not later than Nov. 1.

The American Uniform Boiler-Law Society, through its chairman, Thomas E. Durban, reports that the legislature of Louisiana passed a bill authorizing the Governor to appoint a commission of five experts to examine the code of the American Society of Mechanical Engineers and to report whether or not it should be adopted as a state law. It also reports that the purchasing department of the Panama Canal Commission specifies that steam boilers shall be constructed according to the A. S. M. E. code.

### A Barrel Elevator Loaded and Unloaded Automatically

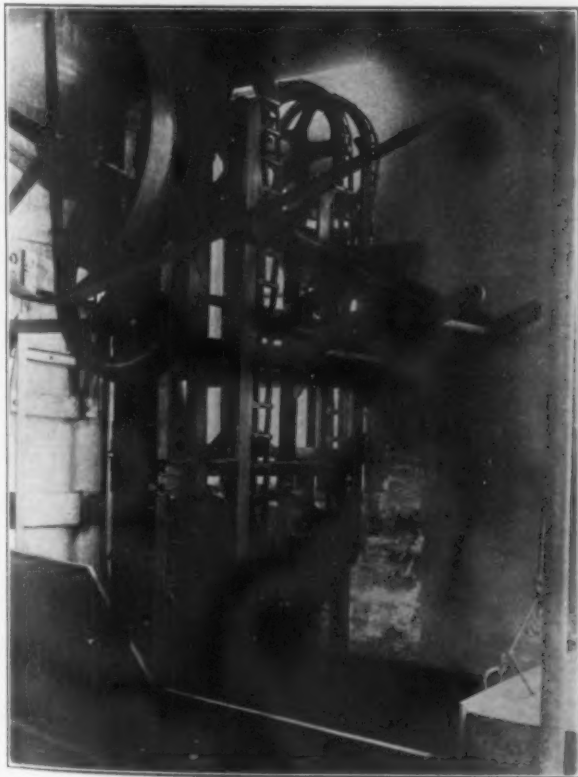
An interesting method of handling oil barrels, suggestive of what may be done in the transport of materials and products in the modern industrial establishment, has been adopted by the Standard Oil Company at its Milwaukee works. The machine is required to elevate empty barrels from the wash house and de-



Elevator Picks Up Package Delivered to It and Dumps It at the Higher Level

liver them to an inclined skid on which they roll by gravity a distance of 100 ft. to the filling room. The barrel elevator has the feature of being capable of picking up barrels from a curved chute underneath the foot sprocket. One end of the chute is just above the level of the floor of the wash room, allowing the barrels to be rolled in by hand and carried up by the curved barrel arm which discharges automatically to the skids.

The accompanying drawing shows the barrel arm in the discharging position, while the reproduction of the photograph shows the elevator frame with the curved receiving chute at the bottom. The barrel arm is at-



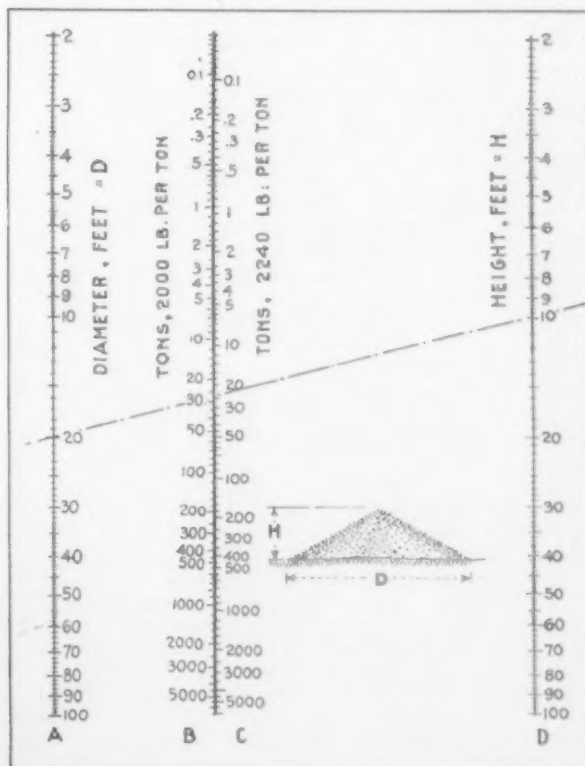
The Elevator with Receiving Space Below the Foot Sprockets for the Barrel Rolled to It

tached to two strands of Griplock chain belt which carry it around the head and foot sprockets. The arm is tripped in the top position by means of a pair of cams engaging the ends of the curved lever arms which carry the barrels. No deep pit was found necessary under the foot sprockets and the equipment is obviously adapted to conditions where it would not be possible to have any part of the machine extend below the floor line.

About 1 hp. is required for driving the elevator and the power is taken from a lineshaft in the building by means of a belt coupled up to the elevator countershaft. The capacity of the machine is 120 bbl. per hour. It was designed and built by the Chain Belt Company, Milwaukee, Wis.

### The Capacity of a Coal Pile

The accompanying chart has been prepared by W. F. Schaphorst, mechanical engineer, Woolworth Building, New York, as a ready and quick means for ascertaining the number of tons of coal in a given pile of the usual conical section of the outdoor storage



Given Diameter and Height, a Straight Edge Shows the Tonnage of the Coal Pile, or for a Given Tonnage, One May Ascertain the Diameter Necessary with a Given Height

yard. Column B gives the number of tons, figuring 2000 lb. to the ton. Column C gives the number of gross tons.

The dotted line drawn across the chart, for example, shows that where the diameter D is 20 ft. (column A), and the height is 10 ft. (column D), the pile contains 27.5 tons (column B), or nearly 25 tons (column C), depending on whether net or gross tons are considered.

A pile of coal 20 ft. in diameter and 10 ft. high is very unusual, however, because the angle of repose is seldom that great. For anthracite the angle of repose is about 27 deg.; coke, 40 deg.; bituminous coal, 36 deg. To find the height to which any of these materials can be piled on a plot of a given diameter, multiply the diameter by 0.25 for anthracite; 0.36 for bituminous coal; 0.42 for coke. The chart will therefore tell just how much coal can be piled on a given level plot.

The Concrete Steel Company, of which William Pietz is Southern manager, will establish a shaping factory and warehouse for general Southern distribution in Birmingham, Ala. A site has been obtained.



## FOUNDRY COLLEGE COURSE

### Instruction to Students at University of Nebraska on Foundry Engineering

In a paper presented at the Cleveland meeting of the American Foundrymen's Association, Sept. 11-15, John Grennan describes the course in foundry work given to the students at the University of Nebraska. Although the course is comprehensive, it does not attempt to make foundrymen of the students. This would be impossible in the time allotted to the course, but the students do learn considerable about the procedure of getting a pattern into the sand and out again, and they also learn the reasons for simplicity in the design of castings.

The students spend in the course nine hours a week for eight weeks. The first four hours in the foundry are spent in the core-room. A mold is rammed up by the instructor, in which the cores to be made are set. After the nature of the different sands and binders is explained, a batch of sand is mixed and the making of cores is demonstrated. The cores consist of two straight round cores and a stop-off core. One of the straight cores is made in halves and pasted; the other is made whole and rolled out on a plate.

The second period is spent in the foundry. The first mold made consists of a flat back with four patterns in the flask. The patterns show the use of four different cores. One is a green sand core and the other three show methods of coring vertical and horizontal holes, one being below the parting, where a stop-off is used. Nearly all the molding is floor work.

The first exercise is the only one on which all the students work at the same time, and is the only one demonstrated completely. A text book is used and individual instruction given when necessary on the other exercises.

The second exercise may be one of several, the choice usually favoring a 12-in., three-blade propeller, which teaches the making of irregular parting lines. As most of the small flasks used in the shop are made of cast iron several sizes and depths of flask patterns are used. These teach the ramming of deeper molds and the ramming of cores in a mold to make the handles. Lugs also are cast on the flask by the use of a loose piece and cover-core. A core pulley with the inside coped out is used to teach the use of soldiers in securing the sand in the mold. This pulley has a flange on the bottom that makes a three-part flask necessary. A 3-in. and a 5-in. elbow are used to teach the setting of chaplets.

There is considerable demand for castings for exercises in the machine shop. Among these exercises is a 2-hp. gasoline engine. The machine shop exercises, with the other work wanted in other departments, create a demand for castings that have to stand the test of being used. This work makes it possible to run the foundry like a jobbing shop for two or three weeks. Very few can learn to make jacket cores that stand the test of being used in a mold. In the heavier work a wheel is made with cored arms and hub and a segment of the rim. This wheel is usually made in the floor. A cylinder head is swept up to show the use of sweeps. This cylinder head is made in dry sand, as are heavy pieces for the machine shop.

Since all the work in the foundry is done by the students, heats are usually run off about once a week, the weight running from one to two tons. All the molds that are passed by the instructor are cast. The students clean out and daub-up the cupola, put in the bottom, weigh out the coke and iron and do the charging. There is no difficulty in running the cupola with students. The only work not done by students is the tapping.

Besides the work done in cast iron, some copper and aluminum alloys are cast. On account of the lack of time and the cost of material only a few of the better students are put on this work, but every class has it explained and sees the crucibles pulled from the furnace and the molds poured.

In the lectures, the time is taken up mostly by descriptions of the cupola and other furnaces for melting

brass and iron, and the metallurgy of metals used in the foundry. Dry sand and loam molding as well as molding machines are taken up.

Foundrymen can expect little from universities in the development of skilled foundrymen until the universities recognize the difficulties encountered. Agricultural, architectural, highway, sanitary, municipal and a great many other engineering subjects are presented in engineering schools. Why not foundry engineering? The Wentworth Institute of Boston gives a course described in *THE IRON AGE*, Jan. 6, 1916. This course is the kind that will produce results that will be of use to foundrymen.

### Effect of Single-Operation Machines on Manufacturing

One of the most notable impressions made on the machine tool industry by the war is the development of the single-operation machine. The effect of this development on manufacturing after the war is discussed editorially in the *Engineer*, of London, Aug. 18, 1916. The single-operation machine was brought about by the necessity of utilizing a vast amount of unskilled labor, who had not the ability nor the time to learn to operate the more complicated usual types of machinery, but who could be taught to perform one operation with accuracy and celerity. The question now arises as to whether or not the single-operation method of manufacture will prevail after the conditions which brought it into being no longer exist.

To answer this question a study must be made of each individual case. In general, the answer will depend on the output desired, the capital expenditure involved in equipment for single-operation or automatic machines, the saving in labor due to the use of the latter, and other similar considerations. Take, for example, a job comprising six distinct lathe operations, each of which requires 10 min. for its completion, in either an automatic or a single-operation machine. A single automatic machine can be employed to do the six operations in succession, while for the same job six of the single-operation machines will be necessary. The gross output of the latter will, however, be six times that of the former.

This general principle, the *Engineer* goes on, will be modified in certain cases by the fact that the automatic and sometimes the single-operation machine may perform more than one operation at one time. Nevertheless, the principle may be established that for equal output, equal numbers of each type of machine must be employed. This immediately involves a larger capital expenditure for the automatic equipment than for the single-operation type, and also greater maintenance and running charges. On the other hand, each single-operation machine requires an operator, while one operator can attend to two, three or even more of the automatic type. Consequently, the operating labor charge is distinctly in favor of the automatic machine. Against this, again, must be balanced the fact that the automatic machines require the services of high-priced tool setters, while most of the tool setting on the single-operation machines can be done by comparatively low-priced operators themselves. While, therefore, the labor cost of the automatic machine in general is lower, this fact must be modified by the conditions attached to each particular case.

In regard to the influence of output, the capital expenditure in idle machinery will be of moment if the single-operation machines are not worked to capacity. Consider again the example cited above. Six single-operation machines will be necessary for the completion of a single piece. If the desired output is six per hour, the single-operation equipment will involve less capital outlay than the corresponding automatic equipment. If, however, the desired output is only two per hour, then each of the single-operation machines will be idle two-thirds of the time. This output could be obtained with but two automatic machines, and it is easily conceivable that the capital tied up in these would be much less than in the six single-operations.

tion machines, and the labor charges would be correspondingly lower.

The influence of the supply of labor on the question also cannot be neglected. In European countries a great number of women and others who would not naturally go into machine shops are being trained in the operation of these single-operation machines. These may not desire to return to their usual occupation after the war, and will form a large reservoir upon which manufacturers can draw for a cheap labor supply. This, with the probable dearth of skilled labor, will put the continuation of single-operation machines on a more favorable basis than it otherwise would have. The whole question bristles with possibilities and its solution cannot be foreseen.

### Canadian Industrial Notes

TORONTO, Sept. 25, 1916.—Canadian steel manufacturers are making a vigorous protest against the new freight rates on iron and steel from interior points to the seaboard for export. They have asked the Board of Railway Commissioners for a suspension of the tariff to become effective Oct. 1, carrying proposed increases from Canadian producing points to both Canadian and United States Atlantic ports. The railroads say that the new tariff is justified by the proposed cancellation of export rates from United States producing points to seaboard and the substitution of the ordinary rates, which latter, however, are much lower than the rates proposed from Canadian producing points to the seaboard. As an illustration, the proposed new rate in the United States from Buffalo to New York City is 16.9c. for 100 lb. and the corresponding rate from Hamilton, Ont., to Montreal is 20c. Canadian manufacturers are at present in the position of having to import unusual quantities of raw material from the United States, from which the railroads derive considerable revenue as a result of the increase in the rates. Thus the domestic producers are placed under the double handicap of paying higher rates on raw material and higher rates to the seaboard on manufactured products. Their claim is that they should have the same rates to Atlantic seaboard ports from Canadian producing points as the United States manufacturers have from their producing points to Atlantic ports.

Canada is stated to be experiencing something like a famine in steel rails. Not only is there a scarcity of rails for the little construction work that is in progress, but rails are needed for the maintenance of established lines. The shortage is due to the war, as the steel mills which, under normal conditions, are large producers of steel rails, are now engaged in the manufacture of shells and other munitions. The situation is being considered by the Canadian Government, with a view to such action as will at least provide a supply of rails sufficient for the maintenance of existing lines. It is expected that there will be a remission of tariff duties on enough rails from the United States to meet immediate requirements.

It is announced that the National Steel Car Company, with head office at Montreal and plant at Hamilton, Ont., has orders on its books and contracts in prospect which should carry the company well into 1918. It has an order from the French Government, placed three months ago, for 3000 artillery trucks on which the company is in a position to start delivery. This business alone is said to be worth \$1,500,000 to \$2,000,000.

The first ferromolybdenum to be produced commercially in Canada was made Sept. 20 at the plant of the International Molybdenum Company at Orillia, Ont. Three electric furnaces are stated to be in operation at this plant.

At the annual meeting of the Canadian Locomotive Company, held at Kingston Sept. 20, all the directors were re-elected and they re-elected officers as follows: Aemilius Jarvis, Toronto, president; J. H. Harty, Kingston, vice-president; Frank G. Wallace, Kingston, general manager; William Casey, manager; J. H. Harty, sales manager; J. H. Birkett, secretary-treasurer. The directors reported plenty of orders on hand

and prospects bright. The order from Russia for 50 locomotives has been completed and negotiations are being conducted with foreign governments for more orders.

The report of the Cockshut Plow Company, Brantford, Ont., for the year ended June 30, 1916, shows a material betterment in the financial position of the company: Liabilities were \$1,264,000 smaller, chiefly due to a reduction in bank and other loans, which stand at \$3,284,407 against \$4,620,473 in the previous year. Profits show an increase of about \$109,000 over the previous year, being \$500,176 against \$391,363. Earnings were at the rate of 7.07 per cent on the preferred stock against 6.05 per cent in the previous year. No dividends have been paid since 1914, when the dividend for the September quarter was deferred, and the directors say that under the circumstances they believe it best that dividends should continue to be deferred until such time as business and commerce are more settled.

The total of Canadian foreign trade in the five months of the fiscal year ended Aug. 31 aggregates \$987,091,361 and for the corresponding period last year \$467,045,501, an increase of \$520,045,860. Trade in August more than doubled. In the five months exports rose from \$200,262,413 to \$446,436,333.

### Steel Conditions in Japan

A great increase in Japan's production of iron is anticipated, according to a report from U. S. Consul George H. Scidmore, Yokohama, Japan. The iron output of the Naichi Steel Tube Mfg. Company, Kamaishi Iron Works, Kanasaki Shipbuilding Yard, Kobe Steel Works, Kishimoto Iron Mfg. Company and the Osaka Iron Mfg. Company, was expected (July 30) soon to be on the market and the output of the Imperial Iron Works will be increased by 6000 to 7000 tons per month when extensions are completed.

The Japan Times states that since the restriction of iron and steel exports from the west, more strenuous efforts have been put forth to obtain iron ores in Japan. These have been successful and the total output for May showed an increase of 67 per cent over last year and that for the five months of the year an increase of 42 per cent. The expectation is that in a few years the country's iron and steel output will be increased 300 to 500 per cent.

### Handbook of Carnegie Bulb Sections

The Carnegie Steel Company, Pittsburgh, Pa., has published the third edition of its pamphlet giving tables and data on the various bulb sections which it is prepared to roll. These sections are not carried in stock regularly because of the limited quantities required in the building of ships and cars, and orders for them are executed as promptly as rolling-mill conditions warrant. The different sections conform to the standards adopted by the British Standards Committee and profile drawings are given, together with tables of dimensions and weights. The tables of elements of the several sizes of the various sections which formed a part of the pamphlet issued last year are also included.

The steel market in China was much depressed just previous to the war and tended to decline even after that. Continental steel bars were selling in the latter part of 1914 as low as \$24 per ton, delivered Shanghai. It was not long before dealers in China realized market necessities and serious buying commenced. Structural steel, ship plates, galvanized sheets, wire nails and tin plates were in great demand. The market advanced by leaps and bounds and by the end of 1915, steel bars sold for more than \$125 per ton.

Newfoundland has copper ores, some running from 4 to 30 per cent copper, with which little was done until after the war broke out. The production in 1915 was about 15,000 tons, of which 12,150 tons, worth \$151,372, went to the United States and the remainder to England, as against about 2000 tons as the 1914 output, valued at \$15,000 and all taken by the United States.



ESTABLISHED 1855

# THE IRON AGE

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## August Exports Exceed Half Billion

The exports of merchandise from the United States have been so steadily increasing in the past two years, making fresh records almost every month, that the announcement of another great gain has become an old story. Nevertheless, the achievement of August in this respect is so wonderful that it is worthy of more than passing mention. For the first time the value of our exports of merchandise in a single month has exceeded half a billion dollars. The figures in fact were \$510,000,000, which was \$35,000,000 more than the previous high record, attained in May of this year. This is stated to be not only a record for the United States but for all countries, as it surpasses anything previously realized in the history of the world.

Imports of merchandise in August decreased, instead of increasing, thus swelling the balance of trade in favor of this country. The imports were a trifle less than \$200,000,000, which was \$47,000,000 below the imports of June, the record month. The August balance of trade in favor of the United States was close to \$311,000,000, being greater than shown in numerous entire years in the past. For the twelve months ended with August the export balance was \$2,465,000,000, against \$1,363,000,000 in the preceding year and \$374,000,000 two years ago.

In view of the very important part which our balance of trade has taken in paying off our foreign indebtedness, it is interesting in this connection to note figures which have recently been made public by L. F. Loree, president Delaware & Hudson Company. Last year Mr. Loree undertook the work of compiling an authentic record of foreign holdings of securities and has completed the work since then of supplying the country with more accurate data than it ever before had concerning the extent of its debt on capital account to other countries. He reports that, whereas on Jan. 31, 1915, the railroad securities of all kinds held abroad had a market value of \$2,704,402,364, on July 31, 1916, the market value of such securities held abroad had been reduced to \$1,110,099,090. The *New York Annalist*, in commenting on this statement, says that it would take but another eighteen months of the continuance by Europe of selling back our securities to us to practically wipe out our indebtedness on account

of railroad stocks, bonds and notes representing previous investments of foreign capital in this country's transportation system. It adds that long before then, however, we shall have ceased to owe anything to Europe on account of imported capital. Since the outbreak of the war we have extended credit to foreign countries to a net amount of something like \$1,300,000,000, which is in excess of the market value on July 31 of the American railroad securities still held beyond our borders. The amount of industrial and miscellaneous American securities held at that date is stated to be relatively unimportant, so far as available records show, and would be offset by a few more credits on the scale of the recent loans to Great Britain and France. It would not take many months like August to wipe the slate clean of every vestige of American indebtedness to foreign investors.

## Steel Contracts and Deliveries

Recently the purchasing agent of a large consumer of iron and steel products visited the selling offices of a steel works in the Central West that owed his company a good deal of material on contracts made at prices very favorable to the buyer, in comparison with those ruling to-day. The mill was far back in deliveries, and the mission of the purchasing agent was to find out why shipments were not being made more promptly and to hurry them forward. Referring afterward to his reception, he said, with some effort at humor, that it was more like that given a canvasser than what a customer would expect. His intimation that his orders would be canceled unless better deliveries were made met the response that the mill was doing the best it could for him under very trying conditions, and that if he chose to cancel the order there would be no pangs of regret but quite the contrary. Needless to say, the order was not canceled, but the situation as his visit revealed it impressed the buyer with its complete reversal of what has been the rule in the relations of buyers and sellers of steel.

Foreign buyers of American steel had a good deal to say last year in complaint of the way in which some of their contracts placed here had turned out. Also the warring governments which found themselves to an unexpected degree dependent on American steel to make their artillery effective have not

relished some of the prices they have had to pay. If they could know all that has gone on in the domestic trade they would appreciate that the war has also imposed high prices and in many directions unprecedented harassment upon the American manufacturing consumer of steel.

We have alluded from time to time to various phases of contract and delivery problems growing out of the present unparalleled situation. Not much is to be gained by discussing their bearing on the contractual relations of steel companies and their customers. It is fair to say that if some of the contracts for steel products entered into last year had been made legally binding in the new sense which some manufacturers have sought to make effective there would have accumulated by this time grounds for no small penalties upon sellers.

It is a question, therefore, whether a complete command of the situation by the mills, in a way never known and not likely to be seen again after the ending of the war, furnishes as perfect a transition to a regime of binding contracts as some published views have intimated. Mutuality is a prime essential of a valid contract. What the manufacturers of steel on the one hand and the manufacturing users and the jobbers on the other hand decide after full consideration to be desirable changes in contract forms are far more likely to stand the test of time and of the buyer's market that is sure to come at length than anything imposed by one side of the market upon the other because conditions have given one side the power. It is much to be doubted that the Federal Trade Commission will say, as it has been asked to say, that a particular contract form has its approval. The problem is one which buyers and sellers must work out together. Something has been gained, much of it by force of circumstances, in a shortening of contract periods and in making the relative needs of buyers the deciding factor, as far as possible, in apportioning shipments. But the bad practices are of too long standing and involve both sides of the market to too great an extent, to expect that they will be permanently reformed by any new contract form, particularly an *ex parte* one. It is not ironclad contract stipulations that are wanted so much as a rule of reasonableness. Meantime much can be done in an educational way if buyers' and sellers' organizations will indicate in a definite way what the binding contract of the future should contain and take a stand in favor of the enforcement of contract obligations.

### Future Home Demand for Steel

There is a growing feeling in the steel trade that the domestic demand after the war will be good. One argument is that capital is accumulating in the United States and is not being put into permanent investments, on account of high construction costs, as it will be when the readjustments after the war have been made. In this connection it is well to recall a reference made shortly before the war to the relations between the steel industry and prospective consumptive demand. In THE IRON AGE of March 26, 1914, under the caption "Future Steel Price Fluctuations," several arguments against the probability of wide price fluctuations in future were

taken up and an effort made to dismiss them. There was, of course, no prescience in that attempt that may be held to be justified by the remarkable course prices have followed in the past twelvemonth, reaching levels that had never been dreamed of; but of particular point at this time was the reference to the fact that with no large construction work on hand "and with the everyday requirements expressed only in terms of a very moderate degree of general business prosperity" the steel industry still found itself then engaged in operating at about two-thirds of its capacity. With everyday requirements greatly increased, on account of general prosperity, and with large construction work on the boards, as may perhaps be expected after the war, the demand for steel may easily be in keeping with the capacity as now being increased. When a period of dullness succeeds one of activity the marvel is where the steel is going, for it appears that hardly any steel at all would be required, and thus the demand always has a substantial basis upon which to build up. If the steel industry could operate at about two-thirds of capacity during the eight months preceding the war, when its condition was by the ordinary standards extremely bad, it may well have large hopes for a period of years after the war.

### Coke and Ore Consumption

Some interesting information as to the ore and coke consumption at blast furnaces is given in the annual statistical report of the American Iron and Steel Institute, just issued. Beginning with 1909 fairly complete reports have been obtained from blast furnaces as to their use of iron ore and of mill cinder, scale, etc. Prior to 1909 the information was not gathered in as much detail. The consumption per ton of pig iron produced has been as follows in gross tons:

	Ore	Cinder, etc.	Total
1909.....	1.886	0.098	1.984
1910.....	1.895	0.102	1.997
1911.....	1.859	0.159	2.018
1912.....	1.872	0.145	2.017
1913.....	1.882	0.099	1.981
1914.....	1.842	0.145	1.987
1915.....	1.843	0.149	1.992

Carefully compiled statistics based upon cargo analyses of Lake Superior ores from season to season have shown conclusively that the average iron content of Lake Superior ores as shipped has been decreasing, at the average rate of a considerable fraction of a unit per year. One would hardly be prepared, therefore, for the remarkable uniformity shown by the above comparison over a six-year interval. A change of one unit in the iron content of an ore running about 50 per cent would involve a change of about 4-100 ton in the ore consumption; yet the total change in six years, shown above, is only 8-1000, or one-fifth as much. If one were endeavoring to calculate the change in the composition of iron ore from the showing, therefore, he would conclude that the change in six years was by only one-fifth of a unit.

There is evidently another explanation altogether. A slight allowance may perhaps be made for improvements in furnace practice; but the chief point is that there is an increasing employment of the richer Lake Superior ores and a decrease in the relative proportion of the leaner ores mined locally,

as in the South. From 1909 to 1913, both record years, the shipments of Lake Superior ore increased by 17 per cent, while the production of all other ore increased only 3 per cent. For many years, indeed, the production of iron ore outside the Lake Superior region has been about 10,000,000 tons in good years and less in poor years, while the Lake Superior production has increased rapidly in the good years.

Among those who endeavor to keep track of the pig-iron producing capacity of the United States there was great surprise early this year, when a production rate of almost 40,000,000 tons a year was attained. Estimates based upon previous performance, with allowance for additional furnaces completed, fell short of that figure by several millions of tons. A discussion of the divergence led to the suggestion that a large part of it at least was due to improvements in practice, due in considerable measure to changes in furnace lines, as by widening the hearth, whereby outputs per stack were increased. It was noted that there was not a corresponding increase in the coke consumption, a furnace using somewhat more coke, perhaps, but making considerably more pig iron. The statistics of coke consumption now presented bear out this theory. The consumption of coke and bituminous coal, the latter being a very small item, per ton of pig iron produced, has been as follows:

	Pounds		Pounds
1912.....	2,436.5	1914.....	2,354.4
1913.....	2,433.3	1915.....	2,252.0

The decrease in coke consumption, from the average of 1912 and 1913 to 1915 was no less than 183 lb., or 7.5 per cent, certainly representing a very decided change. Production in these years was substantially the same, so that approximately the same furnaces were in blast. As there was no material change in the average analysis of the total body of ore used the change in coke consumption may reasonably be attributed chiefly to changes in furnace practice. As the change occurred suddenly it may be assumed that all the furnaces did not contribute to it, but that in future there will be other furnaces able to reduce their coke consumption, so that in relation to the iron content of the ore the coke consumption of the industry as a whole may be reduced further. The average coke consumption at present is of course much higher than the records made years ago at certain furnaces using the particularly pure Lake Superior ores, now practically exhausted. Many furnaces then had runs averaging much less than 2000 lb. of coke per ton of pig iron.

The average limestone consumption last year was 1107.4 lb. per ton of pig iron. This factor has not changed materially for many years. In the past dozen years it has been decreasing rather than increasing.

### Canadian Rail Supply Short

The steel-rail situation with respect to Canada has undergone a decided change in the past eighteen months. It will be recalled that early in 1915 great interest developed in the steel trade, with some excitement outside of the trade, when announcement was made of sales of steel rails to railroads in this country by Canadian rail manufacturers. These transactions were discussed by Government officials,

and an attempt was made to throw discredit on American rail manufacturers because they would not reduce their prices to meet the competition in our markets from our Northern neighbors. The sale of Canadian rails in this country was of course facilitated by the removal of all duties on rails through the passage of the Underwood tariff act. Since then a great change has taken place in the condition of the steel trade throughout the world. Our Canadian correspondent points out, as will be noted in another part of this issue, that the Canadian steel mills are now so overwhelmed with orders for steel for war purposes that they are not producing a sufficient quantity of rails for the country's needs and the government is seriously considering the temporary remission of duties on rails imported from the United States for the purpose of meeting the rail requirements of Canadian railroads.

## CORRESPONDENCE

### United States Standard Gage and Hot Rolled Steel Sheets

*To the Editor:* United States standard gage is a weight gage; it was established by Congressional enactment before hot rolled steel sheets came into general use and consequently was based upon the weight per square foot in ounces of wrought iron, which was found to weigh 0.2778 lb. per cubic inch or 480 lb. per cubic foot. Hot rolled steel has been determined to weigh 0.2833 lb. per cubic inch or 489.6 lb. per cubic foot, just 2 per cent heavier than wrought iron. The decimal thicknesses as shown by the United States standard gage table are approximately equivalents of the several weights established.

For convenience each weight and its approximate decimal thickness has been given a number, and plates weighing 11.25 lb. per square foot (approximately 0.28125 in. thick), otherwise known as No. 1 gage, up to sheets (sometimes called taggers) 0.1875 lb. per square foot (approximately 0.0046875 in. thick) and numbered 44 gage, are generally spoken of in the trade by their respective gage numbers.

The gage numbers, the weights per square foot and the approximate decimal thicknesses more commonly used by the sheet trade are No. 10 gage to No. 28 gage, and the following table is compiled to show the relative thickness of wrought iron, upon which the United States standard weight gages are based, and of hot rolled steel of the same weight:

Gage	Weight, Oz.	Thickness, Wrought Iron, In.	Thickness, Hot Rolled Steel, In.
10	90	0.140625	0.1379
11	80	0.125	0.1225
12	70	0.109375	0.1072
13	60	0.09375	0.0919
14	50	0.078125	0.0766
15	45	0.0703125	0.0689
16	40	0.0625	0.0613
17	36	0.05625	0.0551
18	32	0.05	0.0490
19	28	0.04375	0.0429
20	24	0.0375	0.0368
21	22	0.034375	0.0337
22	20	0.03125	0.0306
23	18	0.028125	0.0276
24	16	0.025	0.0245
25	14	0.021875	0.0214
26	12	0.01875	0.0184
27	11	0.0171875	0.0168
28	10	0.015625	0.0153

A glance at the above table will reveal the fact that hot rolled steel of the same weight per square foot as wrought iron is from approximately 0.003 in. to 0.0003 in. thinner than wrought iron. It is also a well-known fact that hot rolled steel of the same decimal thickness as wrought iron is, as stated in the first paragraph of this article, 2 per cent heavier than wrought iron.

The American Society for Testing Materials has



determined permissible variations in weight and gage above or below which rolled sheared plates may be rejected, having based its allowances on rolled steel weighing 0.2833 lb. per cubic inch, notwithstanding which manufacturers of hot rolled steel have allowed these tolerances to be applied to the entire range of gages and sizes possible to manufacture and on the basis of the United States standard weight gages—i. e., 1 cu. in. of hot rolled steel to weigh 0.2778 lb., which it does not.

Thousands of dollars in claims have been allowed consumers by giving credit for the difference between the theoretical weight as per United States standard weight table plus the allowable variation and the actual weight of the material, whereas if the United States standard weight table were based on the weight of hot rolled steel the actual weight of material would come within the allowable variation.

Many manufacturers of steel roofing and siding buy the flat sheets by the hundred pounds, form them into V-crimped, pressed standing seam, roll roofing, etc., which they then sell by the square (100 sq. ft.); and if the sheets are heavier than the United States standard gage weights, which standard is to-day used almost exclusively in this country, they will not get from the weight bought the number of squares of roofing material they expected; consequently they are in a measure justified in making a claim, as the United States standard is the guide now in effect.

On the other hand, if the sheet manufacturer rolls steel sheets to the weights given in the United States standard weight table they will be thinner than the consumer supposes they should be, which in some instances is a serious fault. For example, if a No. 10 gage steel sheet is hot rolled to weigh 90 oz. per square foot and it finishes 5 per cent light, which variation is allowable, it will be 0.00962 in. thinner than the approximate thickness as given in the United States standard table.

Sheets are usually ordered by the gage number, thus making it impossible for the manufacturer to determine which is the more important of the two, weight or decimal thickness. The result is an injustice to both the manufacturer and consumer, in that the one may be considering the weight of the material while the other is rolling to thickness.

While all manufacturers agree that the United States standard weight table is not correctly applicable to present day practice and product, each hesitates to be the first to publicly advocate a change, perhaps fearing the process of educating the trade would be slow and difficult. However, only the weights as shown in the United States standard table would require to be changed inasmuch as they are generally used more infrequently than either the gage numbers or the thicknesses.

If the matter were taken up vigorously by the Sheet Manufacturers' Association, Congressional enactment of the proper weights, for the decimal thicknesses shown, based on hot rolled steel, weighing 0.2833 lb. per cubic inch, could no doubt be secured and the trade might then be circularized with the corrected table. The consumer would know what sheets of a given thickness should weigh; he would be getting exactly what he ordered and the manufacturers' dilemma would be ended.

SHEET MILL.

### British Advance on Manganese Ore

Manganese ore quotations in England were advanced in the first week of September from 2s. 6d. to 2s. 8d. per unit for 50 per cent Indian ore, shipment this year, and from 2s. 5½d. to 2s. 8d. per unit for next year's shipment, both c.i.f. West Coast, United Kingdom. Brazilian ore is still quoted at 4s. per unit for 50 per cent ore.

Tungsten deposits are now being worked experimentally near the banks of the Miramichi River in New Brunswick. Three veins of ore are reported, one of them 26 in. thick. A concentrating plant of 20 tons daily capacity and a crusher have been installed.

### Copper Contract for 200,000 Tons

Great Britain and her allies, through the agency of J. P. Morgan & Co., and the principal copper producers late last week closed the largest individual contract for copper ever recorded. It calls for 200,000 gross tons, or 448,000,000 lb., of electrolytic copper, to be delivered over the first six months of 1917. Precise information as to price or prices involved is not available, although it is understood that the copper brought between 26c. and 27c. per pound. The total contract price is stated to have been about \$120,000,000, which would indicate that the average price was about 26c. Reports are insistent, however, that 26.75c. to 27c. was paid, sea-board delivery.

The transaction means that the allied governments have agreed to take about one-third of our total production for six months, also that monthly exports probably will establish new records. If evenly distributed over the six months, the contract of itself would mean exporting at the rate of upward of 33,000 tons per month, to which must be added exports to neutral countries. The monthly exports averaged 22,559 tons in 1915; 30,019 in 1914; 31,901 tons in 1913 (the record year). In the first six months of 1916 the exports totaled 147,943 tons, of which the entente allies took 136,635 tons, and in the same period of 1915 the exports totaled 136,527 tons, of which the entente powers took 123,373 tons.

The negotiations were managed in behalf of the producers by John D. Ryan, of the Anaconda Copper Company, and Joseph Clendenin, of the American Smelting & Refining Company. The deal required several weeks for consummation, and knowledge of its progress caused many domestic consumers to cover for their future requirements, with the result that the aggregate of unfilled orders on the books of the producing companies is estimated at 800,000,000 lb.

### The Benzol and Toluol Market

The benzol and toluol market is generally quiet. The quantity of pure benzol available for the balance of 1917 is generally covered by contract. Covering for next year has not yet been extensive. Prices for both spot and contract are 60c. to 70c. per gal., f.o.b. producers. Very little toluol is available for spot or near-by delivery at \$3 to \$3.50 per gal., f.o.b. producer. Contracts are being held up pending the settlement of deals for the manufacture of trinitrotoluol for the allies by large powder companies. Some contract offerings, however, are being made at \$2 to \$3 per gal. The market for solvent naphtha is easier. Supplies which have been scarce are now plentiful, and quotations are from 30c. to 35c. per gal., producer's plant, for both spot and contract.

### Manganese-Ore Shipments from India

Manganese-ore shipments from India for the three months ended June 30, 1916, were 153,209 gross tons, valued at \$988,815, as against 56,072 tons, valued at \$331,938, for the same quarter of 1915. Of the 1916 shipments, 121,013 tons went to the United Kingdom (47,122 tons in April to June, 1915); 12,300 tons to France (against 4000); 7300 tons to Italy (against 4950) and 12,326 tons to the United States, with none a year ago.

The machine tool trade of Germany had the most prosperous year in its history in 1915, according to U. S. Consul John J. Wood of Chemnitz, Germany, where the trade is centered. The largest plant in the industry paid a dividend of 16 per cent, paying off all its indebtedness and setting aside \$60,000 as a fund for the care of families of its workmen serving in the army. Various other machinery firms declared dividends of from 8 to 20 per cent in 1915.

## FOREIGN TRADE COUNCIL

### Action on European Economic Alliances — January Convention in Pittsburgh

The National Foreign Trade Council, which has as a large part of its work the investigation of important questions connected with the export trade of the United States, held an all-day meeting at the Biltmore Hotel, New York, Sept. 21, to take action on the recommendations of its various committees. It was decided to hold the next National Foreign Trade convention in Pittsburgh in the latter part of January, 1917, for further consideration of the policies necessary to safeguard American commerce and, as the slogan of the council has it, to promote "greater prosperity through greater foreign trade." Twenty-two out of the 48 members of the council were present and all sections of the country were represented.

#### PRESIDENT FARRELL'S VIEW

The chairman of the council, President James A. Farrell of the Steel Corporation, gave the annual address in which he said in part:

"The European economic alliances foreseen and discussed at the council's last meeting have, on the part of the Entente Powers, been concluded, and the present prospect is that when peace settles upon Europe there will remain two commercial groups, the members of each undertaking a system of mutual trade preferences, which may automatically create discriminations against neutrals. It would be unwise to assume, as many do, that the highly artificial programme of commercial preferences after the war will break of its own weight. Whether a reversion to mercantile restrictions which, from the end of the Napoleonic wars until the beginning of the present war, had steadily been discarded is a practical method of recovery, remains to be seen. At the end of the conflict the United States will have the greatest gold accumulation ever possessed by a single nation. American foreign trade will surpass all records. The United States will be both the largest customer and the most formidable competitor of Europe, a powerful position, if safeguarded by a sagacious policy.

"Since the total foreign trade of the United States normally is about one-twelfth of that of the entire world, and since both exports and imports serve the interest of our international neighbors and ourselves, it would seem that some method should be devised of arriving at a friendly adjustment of commercial relations without resort to extreme discrimination, possibly leading to trade wars."

#### THE FUTURE OF AMERICAN TARIFFS

Resolutions were passed in which the council, which is non-partisan and non-political, expressed its views upon issues now of outstanding importance to the trade of the country. A summary of the action taken as represented in the various resolutions is as follows:

"1. Called attention to the possibility that the European economic alliances among both the Entente and Central powers, by creating preferences between the nations now allied in arms, may impose discriminations upon the foreign trade of the United States.

"2. Called to the attention of the President of the United States, the Congress and the Tariff Commission, when organized, the necessity 'that the American tariff system, whatever be its underlying principle, shall possess adequate resources for the encouragement of the foreign trade by commercial treaties or agreements or executive concessions within defined limits, and its protection from undue discrimination in the markets of the world.'

"3. Declared that the prospect of keener competition as well as foreign economic alliances after the war makes doubly necessary legislation permitting American exporters to combine, exclusively for foreign trade, as do their foreign rivals. This is an endorsement of the principle of the Webb bill, which passed the House, but will not come before the Senate until the session beginning December.

"4. Enunciated the council's belief in the importance

to American trade of the 'open door' policy in China, and expressed its hope that the President and the Department of State will take steps 'jealously to safeguard this principle.'

"5. Laid plans for expert business men's investigation of the further development of European economic alliances, changes in foreign trade and commercial treaty policies likely to affect the United States.

"6. Planned to co-operate by placing all possible information before the new Government agencies for development of sound foreign trade policies, the Federal Trade Commission, United States Shipping Board, Tariff Commission and Federal Reserve Board.

"7. Continued the council's policy of offering prizes to colleges and universities for student essays on topics related to the merchant marine."

### Effect of European Alliances on the Trade of the United States

A report has just been made public by the National Foreign Trade Council on European economic alliances. A careful investigation has been made under the auspices of the Council and the result is a 117-page pamphlet issued from the Council's office at India House, New York. The object of the report is to give information rather than to argue for a theory, but possible effects upon the United States of any system of preference and discrimination among the nations now at war are pointed out. The pamphlet gives an analysis of European commercial treaty relations and of tariff relations of the United States with European belligerents and neutrals. In general it is shown that the position of the United States with regard to commercial relations with European powers is not much different from that of the European powers among themselves, American products being accorded most-favored nation treatment. The United States, however, gets only such concessions as are provided for by treaties with other countries, mostly European, but there are no concessions granted to others on products in which the United States is largely interested, unless the contracting country also happens to have a strong interest in the particular concession. It is a question how far this condition could continue if the United States became more formidable in export to Europe of manufactured merchandise. Practically all our favored nation treaties are terminable on 12 months' notice. The pamphlet is of great value to every American export interest in giving the largest amount of information brought together in one publication concerning changes in European commercial policy brought about by the war and their possible effects upon the foreign trade of the United States.

### Railroad Car Business

Signs of a growing buying movement for railroad equipment continue. Early decisions are expected in the case of 2000 hopper cars for the Western Maryland, 1500 cars for the Wheeling & Lake Erie, 3000 to 5000 cars for France, and 1000 hopper cars have quietly been bought for the Chesapeake & Ohio. Other active inquiries which may be added to those mentioned last week include 1000 box cars for the Pere Marquette, 500 automobile cars for the Nickel Plate and 70 passenger cars for the Long Island. The Elgin, Joliet & Eastern wants 300 hopper car bodies; the Spanish-American Iron Company is in the market for 150 ore cars; Armour & Co. are considering 500 center constructions, and the Utah Copper Company, following the purchase of 25 concentrate cars of the Pressed Steel Car Company, now will buy 100 to 150 ore cars.

### Tungsten Prices in Great Britain

Ferrotungsten prices in Great Britain have just been revised by the Minister of Munitions. A cablegram to *Commerce Reports* says the new basis is 5s. 6d. per pound of contained tungsten, with powdered tungsten at 6s. 3d. per pound based on 60s. per unit, the price of products on a sliding scale rising or falling 1d. per pound with each variation of 1s. per unit of ore.



## NATIONAL SAFETY COUNCIL

## Iron and Steel and Foundry Sections Among Features of Next Congress

Iron and steel and foundry sectional meetings will be features of the fifth annual safety congress of the National Safety Council to be held at the Hotel Statler, Detroit, Oct. 17 to 20, inclusive. The foundry sectional meeting will occur on Wednesday morning, Oct. 18, and simultaneous with it will be the first iron and steel sectional meeting, which will also hold sessions on Thursday and Friday mornings. Among the other sectional meetings, some thirty in all, may be mentioned the health service section, on Wednesday, Thursday and Friday afternoons of the week of the congress. In connection with the congress there will be a commercial safety device exhibit held at the Detroit armory.

The program of the foundry sectional meeting includes the following addresses:

"Strains, Sprains and Burns," by S. W. Ashe, educational and welfare department, General Electric Company, Pittsfield, Mass.

"Crane and Chain Practices," by F. H. Elam, manager casualty department, American Steel Foundries, Chicago.

"Eye Protection," by F. W. Shepard, safety inspector, American Cast Iron Pipe Company, Birmingham, Ala.

"Alcohol vs. Safety," by Dr. H. P. Hourigan, surgeon, Larkin Company, Buffalo, N. Y.

"Foundry Sanitation," by J. F. Alexander, secretary, Metal Trades Safety Association, Toronto, Can.

The officers of the foundry section are O. J. Fehling, manager National Malleable Castings Company, Chicago; vice chairman, F. G. Bennett, safety department Buckeye Steel Castings Company, Columbus, Ohio; secretary, Earl B. Morgan, safety engineer Norton Company, Worcester, Mass.

The program of the iron and steel section, as stated, requires three different sessions. The officers of the section are as follows and the addresses except those for the Thursday and Friday sections, which were given in last week's issue, are given below:

Chairman, J. M. Woltz, safety director, Youngstown Sheet & Tube Company, Youngstown, Ohio; vice-chairman, George T. Fonda, safety engineer, Bethlehem Steel Company, South Bethlehem, Pa.; secretary, Earl B. Morgan, safety engineer, Norton Company, Worcester, Mass.

"Progress of Safety in Iron and Steel Industry" (illustrated with lantern slides), by Dr. Lucian W. Chaney, U. S. Department of Labor, Washington, D. C.

"Safety in Blast Furnace Operation," by F. H. Wilcox, engineer, U. S. Bureau of Mines, Pittsburgh.

"Safety in Bessemer Operations," by J. H. Ayres, superintendent of safety, sanitation and welfare, National Tube Company, National Works, McKeesport, Pa.

"Safety in Open-Hearth Operations," by Walter Greenwood, safety inspector, Carnegie Steel Company, Youngstown, Ohio.

The health service sectional meetings announce addresses at the Wednesday afternoon session by Dr. L. G. Shoudy, chief surgeon, Bethlehem Steel Company, on "Health Education"; by Dr. Wilbur E. Post, chief medical adviser Peoples Gas, Light & Coke Company, Chicago, on "Physical Examination of Employees," and by Dr. J. C. Bloodgood, medical department Johns Hopkins University, Baltimore, on "First Aid." The Thursday afternoon session includes the following addresses: "The Company Doctor," by Dean S. S. Marquis, department of education, Ford Motor Company, Detroit; "Employment, Medical Supervision and Safety," by L. A. Phelps, superintendent, insurance and maintenance, Avery Company, Peoria, Ill., and by J. H. Weller, supervisor of labor, Packard Motor Car Company, Detroit; "Industrial Hospital and Dispensaries," by Dr. T. R. Crowder, chief surgeon, Pullman Company, Chicago; "Hernia," by Dr. James Burry, chief surgeon, Illinois Steel Company, Chicago, and "Dental Work in the Industries," by Dr. C. E. Smith, dental clinician, B. F. Goodrich Company, Akron, Ohio. The Friday morning session includes addresses on the relation of health to industry, the medical supervision of workmen, the reduction of health hazards and standards of industrial hygiene. The chairman of the

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Health Service Section is Dr. Otto P. Geier, director of the employees service department Cincinnati Milling Machine Company, Cincinnati, and the secretary is G. L. Avery, secretary Avery Company, Peoria.

## OBITUARY

### J. H. Sheadle

Jasper H. Sheadle, vice-president of the Cleveland-Cliffs Iron Company, Cleveland, and vice-president of the Lake Carriers' Association, died at a hospital in Syracuse, N. Y., Sept. 22, aged 57 years. He was taken ill with abdominal trouble while on his way to the White Mountains with Mrs. Sheadle and was taken to the hospital where he was operated on the Sunday before his death, being ill less than a week. He had been identi-



J. H. SHEADLE

fied with the Lake Superior iron ore industry over 25 years and was very widely known in the iron trade. He was born in New Bedford, Pa., which is near Youngstown, Ohio, and received his training in the common schools and at Hiram College, Hiram, Ohio. His first employment was with his father as teller of the Girard Savings Bank, Girard, Ohio. Two years later he became connected with the Second National Bank at Youngstown and at twenty-four was made assistant cashier. His connection with iron and steel dates from 1888 when he was made secretary and manager of the Mahoning Valley Iron Manufacturers' Association, which was formed in that year. In 1890 he went to Cleveland as secretary of the Cleveland-Cliffs Iron Company, successor to the Cleveland Iron Mining Company, which was the first to make shipments from the Lake Superior country. About three years ago he was elected vice-president of that company, of which William G. Mather is president. In addition to his duties as vice-president he had charge of the ore sales and Lake transportation. Since the reorganization of the Lake Carriers' Association he has been its vice-president and since 1909 he has been chairman of the welfare plan committee of that organization. He took a deep interest in the welfare work in behalf of the Lake seamen, developing the plan which has brought remarkable results in improving the condition of sailors. A feature of the work in which he was particularly interested was that designed to aid seamen in the saving of their wages. He was a director of several Cleveland banks and Lake transportation companies and a member of a number of Cleveland clubs. His scrupulous integrity, his native kindness and his deep interest in human betterment were outstanding qualities, com-

bined in an unusual way with business talent of a high order.

The following tribute to Mr. Sheadle was paid by Harry Coulby, president of the Pittsburgh Steamship Company: "In the death of Mr. Sheadle, the navigation interests of the Great Lakes have lost one of their ablest men. He has been one of the leaders in the business for nearly thirty years. The work, however, which seemed particularly to appeal to him, and which he loved, was the welfare of the sailors. When the welfare committee was appointed a number of years ago, he was selected as its chairman, a position he filled to the day of his death. He was the father of the savings plan, which was eminently successful from the day of its adoption, and under which the sailors of the Great Lakes now have on deposit out of their earnings more than \$400,000. He was also vitally interested in sanitation, proper quarters and clean, wholesome living on board ship. In his passing, the sailors of the Great Lakes have lost a friend who gave his time and his energies cheerfully for their betterment."

### Cromwell Steel Company Will Build Plant

The Cromwell Steel Company, Cleveland, has been incorporated with a capital stock of \$2,000,000 to build a new steel plant in Lorain, Ohio, preliminary mention of which was made in THE IRON AGE of Sept. 21. This plant will be modeled after European steel works, in that ultimately no raw steel but only the finished product will be placed on the market. The bulk of its products will be in light and heavy forgings, largely for the automobile trade. The plant to be built at present will consist of four 75-ton open-hearth furnaces and the necessary finishing mills. Contracts are now being placed and construction work will be started at once with a view of getting in productive operation at the earliest possible moment. The plant will be located on a site of 252 acres adjoining the works of the National Tube Company.

The officers of the company will be as follows: President, J. C. Cromwell, Cleveland; vice-president, W. D. Batsholts, Paris, France; general manager, Allen C. Ryan, formerly superintendent of the rail mill of the Tennessee Coal, Iron & Railroad Company, and later superintendent of the rail mill of the Bethlehem Steel Company; secretary, E. S. Griffiths, president of the Cleveland Machine & Mfg. Company, Bishop-Babcock-Becker Company, Cleveland, and Buckeye Engine Company, Salem, Ohio; treasurer, G. L. Jones. The offices are in the Guardian Building, Cleveland.

### Scrap Iron and Steel Exports

Exports of scrap iron and steel from the United States are now very large, having been 286,728 gross tons for the fiscal year ended June 30, 1916, or at the rate of 23,894 tons per month. The contrast with previous records is shown by the following table from Government data:

	Gross Tons Per Month
Fiscal year ended June 30, 1916.....	23,894
Year 1915 .....	6,613
Year 1914 .....	2,761
Year 1913 .....	8,119

The exports in May were 24,889 tons; in June they were 15,867 tons, falling to 4788 tons in July.

### Old Material Prices in Germany

The Royal Prussian Ordnance Works at Spandau, Germany, recently conducted a sale of scrap at which the following prices are reported, the prices at the last previous sales also being given:

Material	Price, Last Sale,	
	Marks	Marks
300 tons steel turnings.....	55.8	37.6
50 tons mild steel scrap.....	58.1	50.3
50 tons hammer scale.....	50.6	24.2
150 tons crucible-cast steel turnings...	48.5	37.2

The quotations were for material delivered on cars at the works.



## PERSONAL

John A. Topping, chairman of the Republic Iron & Steel Company, has largely recovered from an illness of the past few weeks and has gone to Canada for a short stay.

Prof. Henry C. Emery, formerly chairman of the United States Tariff Board, and for nine years professor of political economy at Yale, sailed Sept. 23 on the St. Paul for Petrograd, where he is to represent the Guaranty Trust Company of New York in special work, preliminary to an extension of its interests in Russia. He will make a thorough study of industrial and financial conditions. While making his headquarters at Petrograd, Professor Emery will visit all sections of the empire in the course of his investigations.

J. Edward Dailey, formerly with the Algoma Steel Company, Sault Ste. Marie, has been appointed general superintendent of the open-hearth steel plant of the Youngstown Iron & Steel Company, Youngstown, Ohio, succeeding Archie G. Smith, who resigned to go with the Trumbull Steel Company.

Guy Hutchinson, secretary and treasurer Hart & Hutchinson Company, New Britain, Conn., will shortly sever his connection with that company to engage in business in New York.

William Whitely, for 20 years foreman of the pattern and plate department of the North & Judd Mfg. Company, New Britain, Conn., has resigned to become foundry superintendent of the M. B. Schenck Company, Meriden, Conn.

William H. Cummings, formerly of Providence, R. I., who has had much experience in sheet metal and skylight work, has become associated with the Waugh glazing department of the Asbestos Protected Metal Company, Pittsburgh. Many of the prominent industrial structures now being erected include in their construction details either Waugh skylights or Waugh monitor sash.

D. J. Murphy, formerly in the flat steel sales department of the American Steel & Wire Company, has joined the Twisted Wire & Steel Company, 437 Eleventh Avenue, New York City.

Harry L. Bill has resigned as general manager of the Hayes Mfg. Company, Detroit, to devote his entire time to the business of the Springfield Body Company. He has been in charge of the work of both companies for some time, but the increased business of the Springfield Company, of which he is vice-president and general manager, compelled him to take this action.

Irving P. Miller, formerly engineer and superintendent of production for the Toledo Carriage & Woodwork Company, has been engaged as chief engineer and production manager for the Universal Valveless Four-Cycle Motor Company, Grand Rapids, Mich., which is at present seeking a location for its plant.

W. H. Bischoff, superintendent of open-hearth department No. 2 of the Saucon plant of the Bethlehem Steel Company, has resigned to become superintendent of coke ovens, blast furnaces and open hearths for the Dominion Iron & Steel Company, Sydney, Nova Scotia. Mr. Bischoff had been with the Bethlehem company for 24 years.

C. F. Kettering, general manager Dayton Engineering Laboratories Company, addressed the Engineers' Club of Cincinnati at its first fall meeting on the evening of Sept. 21. His subject was, "Some Present and Future Carburetion Problems."

Sven Winqvist of Gothenburg, Sweden, inventor of the S. K. F. ball bearing, on Sept. 23 visited the new American factory of the S. K. F. Ball Bearing Company at Hartford, Conn. Mr. Winqvist, who is president of the Swedish company and a trustee of the Connecticut company, expressed himself as much pleased with the splendid start made by the American factory, which is already producing more bearings than its rated capacity, and stated that large additions to the present buildings

would soon be necessary. After completion of the inspection Mr. Winqvist posted a notice stating that in appreciation of the excellent work done by the Hartford factory, Saturday, Sept. 30, would be a holiday with full pay.

Joseph P. Pinney, purchasing agent Kilbourne & Jacobs Mfg. Company, Columbus, Ohio, has resigned, effective Oct. 1, to accept a position with the Joseph Schonthal Iron Company, Columbus.

Scott A. Rogers has been appointed a salesman for the United Steel Company, Canton, Ohio, in the Cleveland territory.

W. I. Ballentine, formerly general superintendent of the Indianapolis works of the Link-Belt Company, has been appointed works manager of the Chain Belt Company, Milwaukee, effective Oct. 1.

### Pig-Iron Manufacturers Entertained at Detroit

The American Pig Iron Association was entertained at Detroit, Sept. 22 and 23, by the Charcoal Iron Company of America. A large number were present from the Cleveland and other districts. F. W. Hutchings, treasurer of the company, met the guests at the Pontchartrain Hotel with automobiles and they were taken to the Bloomfield Hills Country Club, where they spent the two days.

A formal meeting of the association was held Friday morning, after which luncheon was served. The members then went over the golf course preliminary to the golf match to be held the following day. Friday evening members were much surprised at a banquet prepared for them. A large table had been arranged to form a charcoal-iron blast furnace and chemical plant, with miniature lakes and steamboats, roads and lawns, and a miniature railroad with locomotive and cars, all electrically operated, making trips in and about the plant. Mr. Hutchings acted most acceptably as toastmaster, and William McLauchlan of Pickands, Mather & Co. was in his best form as an after-dinner speaker. A number of others responded to toasts.

During the golf tournament on Saturday, T. E. Friend of Pittsburgh won the cup presented by Leonard C. Hanna; Francis B. Richards of Cleveland, the one presented by the Charcoal Iron Company of America, and Mr. Hine of Girard, the trophy presented by William McLauchlan.

### Iron and Steel Electrical Engineers

At the annual meeting of the Association of Iron and Steel Electrical Engineers at the Hotel La Salle, Chicago, Sept. 18 to 22, officers were elected as follows:

President, F. D. Egan, Pittsburgh Crucible Steel Company, Midland, Pa.

First vice-president, C. A. Menk, Carnegie Steel Company, Homestead Works, Munhall, Pa.

Second vice-president, S. C. Coey, Youngstown Sheet & Tube Co., Youngstown, Ohio.

Secretary, John F. Kelly, McKeesport, Pa.

Treasurer, James Farrington, La Belle Iron Works, Steubenville, Ohio.

The dues for associate membership were raised from \$5 to \$7.50 per year and companies producing iron and steel are now admitted to membership, these concerns to be admitted at dues ranging from \$25 to \$100, according to the number of employees on their payrolls.

The Associated Business Papers, formerly the Federation of Trade Press Associations, will hold its annual convention at the Hotel Astor, New York, Oct. 26, 27 and 28. There will be open forum sessions for the discussion of questions relating to every phase of the making of business newspapers. For advertisers an exhibit has been arranged of all the steps in the conduct of successful advertising campaigns.

The New Britain Machine Company, New Britain, Conn., gave its employees a seashore outing at Cosey Beach on Sept. 19. An attractive program was issued, detailing the music, sports, entertainment and shore dinner that were provided.

# Iron and Steel Markets

## EXPORT BUYING RENEWED

### Basic and Bessemer Pig Iron Advance

#### Railroad Equipment Orders Broadening—Car Shortage at Pittsburgh

The first real pinch of car shortage cut down shipments at some Pittsburgh district steel works in the past week, and here and there more has been heard of labor shortage. Deliveries are not improving and all indications are that the tension will increase rather than relax.

Domestic buying of finished steel for delivery after Jan. 1 is not heavy. Following various sellers' refusals to consider forward contracts a good many consumers are now disposed to take the market as they find it. Now and then surprisingly early deliveries seem to be available, but such cases are only eddies in a generally strong current.

There are signs of fresh export buying for everyday rather than war purposes. It is now several months since the last considerable demand of this sort. Italy is a large general buyer, all apart from the Italian inquiry for 45,000 tons of billets for shells, on which delivery is asked as soon as it can be made. Wire, plates, sheets and tin plates are wanted in large quantities for various foreign markets.

In prices the most significant change is an advance of 50 to 75 cents in basic iron in the Middle West, or to \$19 at Valley furnace, and a corresponding rise in Bessemer iron. In semi-finished steel the situation is indicated by an advance of \$5 by a large producer in the contract price of sheet bars. Sheet prices are notably stronger; another advance in wire products is looked for but has not come, and for bars and structural shapes mill prices for early delivery have been raised by some producers. In one case an offer of 3.75c. on 48,000 tons of plates for 1917 was refused, the mill holding for 4c.

All the calculations of the large producers of steel look to the full operation of an increased capacity far into next year. One Eastern company has reserved a large amount of Lake Superior ore for 1917 and may take as much more, and another Pennsylvania steel interest has taken up several hundred thousand tons of high grade ore, at the 1917 price when determined.

Car business is growing, the railroads having become adjusted to the high prices, and car works could make good deliveries if they could get plates. In 60,000 tons of car steel just sold at Chicago some of the plates cannot be had until after the middle of 1917. France is about to place 3000 to 5000 freight cars here and for domestic railroads more than 11,000 cars are under inquiry. Indica-

tions are that the railroads have only started on their equipment buying.

Exporters are still scouring the country for shell steel for shipment this year, but get little. Everything is under requisition, a large steel casting company shipping 20,000 tons of ingots a month to companies having contracts for shells or shell forgings.

In the lighter finished lines wire products and sheets have developed an unexpected demand. At Chicago two railroads have tried without success to place wire fence contracts. In sheets the buying has been heavier than in weeks.

The difficulty of getting structural steel has caused an increase in concrete work and good sales of rail carbon bars for reinforcing.

Foundry iron has not kept pace in all districts with the advance in basic and Bessemer. At Chicago the competition of Southern and Northern high phosphorus irons has been a feature, but in northern Ohio foundry irons are 50c. higher. In Southern iron September sales have been large, and one producer has withdrawn from the market for this year. The leading pipe interest has been a buyer of 10,000 to 15,000 tons for this year's delivery. While the Alabama iron market is stronger, there is still out a very considerable volume of warrants.

An interesting basic inquiry in Ohio is for 36,000 tons to be shipped in the first half of 1917 to an open-hearth plant which cannot be finished until late next year. A Cleveland furnace has sold 16,000 tons of basic iron and at Pittsburgh 12,000 tons was sold for the first half, settlements to be made at the market price. An eastern Pennsylvania steel company has bought 56,000 tons of basic iron for the first half of 1917 at \$20 and under, delivered.

The coke market shows continued strength. A furnace contract for 10,000 tons a month in the first half of next year has been closed on a \$3 basis.

## Pittsburgh

PITTSBURGH, PA., Sept. 26, 1916.

A decided car shortage is now confronting the local steel trade, and it may grow worse when the bad weather comes. The loading crew at one large steel plant was recently laid off for one turn because it had no cars to load, and none was received for nearly 24 hours. The shortage of labor is also being felt, holding down the output on nearly everything. There is still an acute shortage in the supply of steel, but this may be relieved to some extent within the next 60 days by new capacity coming in. There is every indication that an upward movement in pig iron, semi-finished steel and on most lines of finished material is under way. The long-expected rise in prices of Bessemer and basic pig iron has come, the market on both grades having gone up in the past week from 75c. to \$1 per ton. Consumers are now trying to cover, and find they have to pay considerably more than they could have bought for a month ago. The leading interest and nearly all the outside mills have advanced black and galvanized sheets, Bessemer and open-hearth stock, \$2 a ton. An advance in wire products is looked for any day, and there is a famine in the supply of wire nails. Mill prices on steel bars and shapes are practically



## A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics  
At date, one week, one month, and one year previous

### For Early Delivery

		Sept. 27, 1916	Sept. 20, 1916	Aug. 30, 1916	Sept. 29, 1915
<b>Pig Iron, Per Gross Ton:</b>					
No. 1, Philadelphia...	\$19.50	\$19.50	\$19.50	\$16.25	
No. 2, Valley furnace...	18.50	18.50	18.25	14.75	
No. 3, Southern, Cin'ti...	17.40	17.40	16.90	14.40	
No. 4, Birmingham, Ala.	14.50	14.50	14.00	11.50	
No. 5, furnace, Chicago*	18.00	18.00	18.00	14.25	
No. 6, del'd, eastern Pa.	19.75	19.75	19.75	17.00	
Basic, Valley furnace...	10.00	18.25	18.00	15.00	
Bessemer, Pittsburgh...	22.05	22.20	21.95	16.95	
Malleable Bess., Ch'go*	19.00	19.00	19.00	15.00	
Gray forge, Pittsburgh...	10.20	18.95	18.70	14.70	
L. S. charcoal, Chicago...	19.75	19.75	19.75	15.75	

<b>Billets, etc., Per Gross Ton:</b>		Sept. 27, 1916	Sept. 20, 1916	Aug. 30, 1916	Sept. 29, 1915
Bess. billets, Pittsburgh...	45.00	45.00	45.00	24.50	
O.-h. billets, Pittsburgh...	45.00	45.00	45.00	25.00	
O.-h. sheet bars, P'gh...	45.00	45.00	45.00	25.50	
Forging billets, base, P'gh	69.00	69.00	69.00	33.00	
O.-h. billets, Phila...	48.00	48.00	48.00	30.00	
Wire rods, Pittsburgh...	55.00	55.00	55.00	30.00	

### Finished Iron and Steel.

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47 1/2	1.47 1/2	1.47 1/2	1.25
O.-h. rails, heavy, at mill	1.56 1/2	1.56 1/2	1.56 1/2	1.34
Iron bars, Philadelphia...	2.65 1/2	2.65 1/2	2.65 1/2	1.50 1/2
Iron bars, Pittsburgh...	2.60	2.60	2.60	1.35
Iron bars, Chicago...	2.35	2.35	2.35	1.35
Steel bars, Pittsburgh...	2.60	2.60	2.60	1.35
Steel bars, New York...	2.76 1/2	2.76 1/2	2.76 1/2	1.56 1/2
Tank plates, Pittsburgh...	4.00	4.00	4.00	1.35
Tank plates, New York...	4.16 1/2	4.16 1/2	4.16 1/2	1.56 1/2
Beams, etc., Pittsburgh...	2.75	2.60	2.60	1.35
Beams, etc., New York...	2.76 1/2	2.76 1/2	2.76 1/2	1.56 1/2
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.35
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.40
Steel hoops, Pittsburgh...	3.00	3.00	3.00	1.40

\*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

<b>Sheets, Nails and Wire,</b>		Sept. 27, 1916	Sept. 20, 1916	Aug. 30, 1916	Sept. 29, 1915
Per Lb. to Large Buyers:		Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, P'gh	3.00	2.90	2.90	1.90	
Galv. sheets, No. 28, P'gh	4.25	4.15	4.15	3.50	
Wire nails, Pittsburgh...	2.60	2.60	2.60	1.75	
Cut nails, Pittsburgh...	2.60	2.60	2.60	1.60	
Fence wire, base, P'gh...	2.55	2.55	2.55	1.60	
Barb wire, galv., P'gh...	3.45	3.45	3.45	2.60	

### Old Material, Per Gross Ton.

Iron rails, Chicago...	19.25	19.25	18.75	13.50
Iron rails, Philadelphia...	20.00	20.00	20.00	18.50
Carwheels, Chicago...	11.75	11.75	11.50	12.00
Carwheels, Philadelphia...	15.50	15.50	15.50	14.00
Heavy steel scrap, P'gh...	16.50	16.25	16.00	14.25
Heavy steel scrap, Phila.	14.75	14.75	14.75	15.00
Heavy steel scrap, Ch'go.	16.25	16.25	15.25	11.75
No. 1 cast, Pittsburgh...	15.00	14.50	14.50	13.00
No. 1 cast, Philadelphia...	16.00	16.00	16.00	14.00
No. 1 cast, Ch'go (net ton)	12.25	12.25	11.50	10.50
No. 1 RR. wrot, Phila...	20.00	20.00	20.00	16.50
No. 1 RR. wrot, Ch'go (net ton)	16.50	16.50	15.50	11.00

### Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt...	\$3.00	\$2.85	\$2.90	\$1.70
Furnace coke, future...	2.85	2.75	2.50	2.25
Foundry coke, prompt...	3.25	3.25	3.50	2.15
Foundry coke, future...	3.50	3.50	3.50	2.40

### Metals.

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	28.00	28.25	27.50	18.00
Electrolytic copper, N. Y.	28.75	28.50	27.25	18.00
Spelter, St. Louis...	8.75	9.50	8.75	14.25
Spelter, New York...	9.00	9.75	9.00	14.50
Lead, St. Louis...	6.85	6.85	6.50	4.42 1/2
Lead, New York...	7.00	7.00	6.50	4.50
Tin, New York...	38.02 1/2	38.50	39.25	33.25
Antimony, Asiatic, N. Y.	11.00	11.00	13.50	28.00
Tin plate, 100-lb. box, P'gh	\$5.75	\$5.75	\$5.75	\$3.15

certain to be advanced within a short time. Scrap is in better demand, and prices are advancing.

**Pig Iron.**—There is a heavy demand for Bessemer and basic iron with large sales, and a good movement in foundry iron. One fairly large block of basic iron for last quarter and first quarter shipment has been sold at \$19 or better, Valley furnace, and there has also been a fairly large sale of Bessemer iron at \$22 or better. A Cleveland furnace interest has sold 16,000 tons of basic to the American Steel Foundries at Sharon, Pa., and another interest has sold 12,000 tons of basic, 2000 tons per month for first half of 1917, at the average monthly market price. We also note a sale of 2000 tons of Bessemer for fairly prompt shipment at \$22.50, Valley furnace. The Trumbull Steel Company, which is to build an open-hearth steel plant at Warren, Ohio, as noted in these columns, has an inquiry out for 6000 tons of basic iron per month for the first half of next year. While its steel plant will not be ready for operation before the latter part of next year, it is said that if the company buys this iron it will pile it, and the object in trying to get iron now is to have it ready for the steel plant when it is finished. We note a sale of 15,000 tons of basic to a Youngstown interest at \$19, Valley furnace, to be delivered as soon as the seller can ship it. Quotations have been advanced and are now as follows: Basic, \$19 to \$19.25; standard Bessemer, \$22 to \$22.50; No. 2 foundry, \$18.50 to \$19; malleable Bessemer, \$19 to \$19.25; and gray forge, \$18.25 to \$18.50, all at Valley furnace, the freight to Pittsburgh and Cleveland districts being 95c. per ton.

**Billets and Sheet Bars.**—It is confirmed that prices on contracts for sheet bars for fourth quarter will be about \$5 per ton higher than for third quarter. A leading sheet mill shopped around last week for 1000 tons of open-hearth bars, which it could not find for prompt shipment, and finally bought 1000 tons of Bessemer bars at \$45 at maker's mill. It is not believed bars could be found at less than \$45 at mill. We quote soft Bessemer and open-hearth steel billets and sheet

bars at \$45 to \$50 at mill, Youngstown or Pittsburgh. We quote forging billets at \$69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 extra.

**Ferroalloys.**—Ferromanganese for sale in the open market is now being manufactured in this country by four establishments as follows: The Miami Products Company, Chicago, operating one blast furnace; American Manganese Mfg. Company, Dunbar, Pa., one furnace; E. J. Lavino & Co., Philadelphia, one furnace at Sheridan and one at Lebanon, Pa.; Bethlehem Steel Company, Sparrows Point, Md. The Bethlehem Steel Company is stated to be offering ferromanganese quite freely in the Pittsburgh market. The Carnegie Steel Company is manufacturing ferromanganese for its own steel plants and for other plants of the United States Steel Corporation, but has also been a seller to some extent in the open market, mainly, however, to steel makers particularly in need of ferromanganese and in such a position that it seemed to be necessary to help them out. Another subsidiary of the Steel Corporation, the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., is producing ferromanganese. The lowering of the price to \$164 per ton, seaboard, for either foreign or domestic 80 per cent ferromanganese does not seem to have stimulated the demand, which is quiet. It is said that one or two makers of domestic have recently quoted \$160 per ton at furnace, or slightly less. There seems to be more ferromanganese offering than is wanted. We quote foreign and domestic 80 per cent ferromanganese at \$160 to \$164, seaboard. We quote 18 to 22 per cent spiegeleisen at \$40 to \$45, and 25 to 30 per cent \$55 to \$65, at furnace. On 50 per cent ferrosilicon we quote \$88 to \$89 in lots up to 100 tons; over 100 tons, \$87 to \$88, and over 600 tons, \$86 to \$87, all per gross ton, f.o.b. Pittsburgh. We quote Bessemer ferrosilicon as follows: 9 per cent, \$30; 10 per cent, \$31; 11 per cent, \$32; 12 per cent, \$33; 13 per cent, \$34.50; 14 per cent, \$36.50;

15 per cent, \$38.50, and 16 per cent, \$41. Seven per cent silvery is \$28.50; 8 per cent, \$29; 9 per cent, \$29.50; 10 per cent, \$30; 11 per cent, \$31, and 12 per cent, \$32. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., all having a freight rate of \$2 per gross ton to Pittsburgh.

**Steel Rails.**—Three or four leading railroads that thought they had fully covered their needs of rails for all of 1917 now find they have not bought enough and have active inquiries out, desiring to get the same deliveries on these new orders that are called for in their contracts placed some time ago, but this is impossible. The Pennsylvania Lines West are in the market for 5000 tons of rails, the Ann Arbor for 4000 tons, and the Chicago Northern for 3000 tons. It is also stated that the New York Central and the Baltimore & Ohio are figuring on buying more rails. The new demand for light rails is only fair, the lumber interests and the traction lines buying very few, most of the business being placed in light rails coming from the coal-mining companies. We quote 25 to 45 lb. sections at \$47; 16 and 20 lb., \$48; 12 and 14 lb., \$49, and 8 and 10 lb., \$50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at \$33 and of open-hearth \$35, per gross ton, Pittsburgh.

**Plates.**—It seems the railroads have finally decided that it is useless to hold off from placing orders for steel cars and have decided to pay the high prices now being quoted by the carbuilders. Active inquiries are now in the market for 18,000 cars for fairly prompt shipment, but while the car companies could probably make good deliveries on these cars if they could get the plates and shapes it is doubtful whether these materials could be furnished by the mills under six to nine months. The Illinois Central has placed 500 refrigerator cars with the Haskell & Barker Car Company, the Utah Copper Company has placed 24 mine cars and the New York Central 10 passenger coaches with the Pressed Steel Car Company. Active inquiries include 1000 steel hoppers for the Western Maryland, 1000 box cars for the Pere Marquette, 500 automobile cars for the Nickel Plate, 500 general service cars for the Missouri Pacific and numerous smaller orders. The mill price on plates remains at 3c. for delivery some time during 1917, while for delivery in two to four months prices range from 3.25c. to 4c. at mill. One leading plate mill states it has sold readily ¼-in. and heavier sheared plates for delivery in four to six months at 3.25c. to 3.50c. at mill.

**Structural Material.**—New inquiry is fairly active, but there is no doubt that a good deal of work is being held up. The McClintic-Marshall Company has taken 1500 tons for a bridge for the Southern Railway, and the Massillon Bridge & Structural Company has taken about 500 tons for extensions for the plant of the Mansfield Sheet & Tin Plate Company, Mansfield, Ohio. Revised bids are to be taken Sept. 30 for 4500 tons for the shops at the Norfolk navy yard. Mill prices on beams and channels up to 15 in. remain at 2.60c. to 2.75c. at mill for such deliveries as the mills can make, which would not be before next year, while small lots from stock for fairly prompt shipment bring 3c. to 3.25c., Pittsburgh.

**Sheets.**—For the first time in some months we can report a fairly heavy demand for black and galvanized sheets for delivery over the remainder of this year. Prices are firm, and with most mills slightly higher. Several galvanizing plants that have not been active in the sheet market for some time now find they have a demand for galvanized sheets, and have lately placed orders for black sheets for fairly prompt delivery, which they will galvanize. The higher prices for sheet bars in fourth quarter and the better demand are the reasons for the higher market on Bessemer black and galvanized sheets. The export demand is good and sheet mills are now entering more new orders than for some time. Higher prices are looked for soon on galvanized sheets and also on blue annealed. It is stated that so far none of the mills is selling sheets for delivery beyond this year, but will likely start to do so in a short time. We now quote Nos. 9 and 10 blue annealed sheets at 2.90c. to 3c.; No. 28 Bessemer black, 3c., and open-hearth, 3.10c.; Nos. 28 galvanized, either Bessemer or

open-hearth, 4.25c.; Nos. 22 and 24 black plate, tin-mill sizes, H. R. & A., 2.90c.; Nos. 25, 26 and 27, 3c. to 3.10c.; No. 28, 3.10c. to 3.15c., and No. 29, 3.20c. to 3.25c. These prices are for carloads and larger lots, f.o.b. mill, Pittsburgh.

**Tin Plate.**—The leading interest has fixed its price on any tin plate from stock for this year's delivery at \$5.50 per base box, and has no production tin plate to sell for shipment before next year. A good part of the Pacific coast salmon packing trade in tin plate for the first quarter has been placed and in a few cases a flat price has been named, but on most contracts the price was left open to be fixed later. All the mills will carry over into 1917 a large amount of tin plate that should have been delivered in the last quarter of this year. For this reason the price to be fixed in October on tin plate for 1917 will likely apply only on a small part of the shipments consumers will receive in the first quarter. The fact that the base price is expected to be about \$5.50 per box for 1917 will likely operate against the desire of the mills to name prices only for the first half of the year. This price leaves a large margin of profit, and it is not improbable some mills will be perfectly willing when the time comes to sell all the tin plate they can at \$5.50 per base box. Fairly heavy orders are still being placed for first quarter shipment, but none of the mills has as yet opened its books regularly for next year, but all are expected to do so early in October. The output of tin plate this month will be much heavier than in August, as the weather has been much cooler and deliveries of sheet bars from the mills are good. To regular customers mills are quoting tin plate from stock at \$5.50, while production tin plate is quoted at \$5.75 and up to \$6 to the domestic trade. For export, \$6 to \$6.25 per base box is quoted. We quote 8-lb. coated ternes at \$8.50 to \$8.75 for 200 lb., and \$8.75 to \$9 for 214 lb., Pittsburgh.

**Rivets.**—Makers report the new demand fair. Most consumers are covered over the remainder of the year, and some orders have been taken for delivery in the first quarter of 1917. There is some cutting in prices by jobbers who have stocks of rivets bought at lower prices than are ruling now. The export demand is good. One local maker recently shipped three carloads to India and Japan. Makers' quotations are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, \$4 per 100 lb., base, and conehead boiler rivets, same sizes, \$4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

**Railroad Spikes and Track Bolts.**—We note a better demand for railroad spikes, specifications in the past week having come in more freely than for a good many months. Two local makers who recently stated they were not running to more than 50 per cent of capacity are now operating practically full. Railroad spikes at 2.65c. are referred to as being low in view of the fact that steel bars are firm at 2.60c. and higher. The new demand for track bolts is reported active, and prices are firm. We quote track bolts with square nuts at 4.50c. to 4.75c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Track bolts with hexagon nuts take the usual advance of 15c. per 100 lb. Prices on ¼-in. and heavier plates are quoted from 3.75c. to 4c. and higher at mill.

**Cold-Rolled Strip Steel.**—As yet none of the makers has opened books for contracts for cold-rolled strip steel for delivery in 1917, but will likely do so early in October. In the past week contracts for delivery over the remainder of this year were placed in quantities ranging from 100 to 300 tons at \$6 to \$6.50 and higher. Makers report the demand good and say the greater part of their output for this year is under contract. We quote cold-rolled strip steel at \$6 base on contracts for delivery over the remainder of the year, and \$6.50 to \$6.75 in small lots for fairly prompt shipment. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

**Wire Rods.**—The new demand is heavier than the mills are able to supply promptly, and there is a scarcity



of rods for delivery over the last quarter. Some leading consumers are covered through the first quarter and first half of 1917, and only a limited amount of rods is available to meet the general demand. We quote soft Bessemer, open-hearth and chain rods at \$55 to \$60 per ton, f.o.b. Pittsburgh.

**Nuts and Bolts.**—Makers report the new demand good, and some contracts have been placed for delivery in first quarter and first half of next year. All the makers are more or less back in shipments, and state that deliveries of steel bars by the mills are still unsatisfactory. The discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, \$2.70 off list; hex., \$2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, \$2.40 off; hex., \$2.50 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

**Iron and Steel Bars.**—The minimum price on steel bars remains at 2.60c. at mill for such deliveries as the mills can make, which would not be before next year, but it is believed that within a short time the price will be put at 2.75c. On a recent inquiry for bars, plates and shapes for some car work, a Chicago mill quoted 2.60c., Pittsburgh, on the bars, the same on the shapes, and 3c. on the plates, and got the order, about 3500 tons, the freight from Pittsburgh to Chicago, 18.9c. per 100 lb., being added to these prices. It is said that on the large car orders being placed none of the steel carbuilders is getting steel bars under 2.50c., and this price is on options given some time ago. Prices on steel bars from warehouses have been advanced about \$3 per ton, now being held at 3.25c., effective from Sept. 21. The demand for iron bars is active, mills being sold up several months ahead. We quote merchant steel bars at 2.60c. at mill, for delivery in first quarter and first half of 1917, while for prompt shipment from warehouse 3.25c. is now quoted. We quote refined iron bars at 2.75c. to 2.85c., and railroad test bars at 2.85c. to 2.90c., f.o.b. Pittsburgh.

**Wire Products.**—An advance of \$2 or \$3 per ton on wire or wire nails may come at any time. The domestic demand for wire nails is very heavy, and there is an insistent export demand which would quickly take up any surplus nails that might exist. Two local makers say they are not quoting on the export inquiries, having obligations on their books now from domestic consumers for all the nails they will be able to make the remainder of this year. Specifications against contracts for plain and barb wire and wire nails are very heavy, but fence wire is quiet. Prices to the large trade are as follows: Wire nails, \$2.60, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Bright basic wire is \$2.65 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$2.55; galvanized wire, \$3.25; galvanized barb wire and fence staples, \$3.45; painted barb wire, \$2.75; polished fence staples, \$2.75; cement-coated nails, \$2.50, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing remain at 60 per cent off list for carload lots, 50 per cent for 1000-rod lots, and 58 per cent for small lots, f.o.b. Pittsburgh.

**Shafting.**—Some desirable contracts for the large trade have been placed for delivery in the first quarter

and first half of next year on the basis of 20 per cent off list, while other contracts running into first quarter have been taken at 15 per cent off. For shipment over the remainder of this year shafting is hard to find, and it is readily sold at 10 per cent off list, and in a few cases at list. It is expected that in October a heavy business will be placed by large consumers for first half of 1917 delivery. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

**Merchant Steel.**—Mills report the new demand heavy. Some consumers are trying to cover their needs for the first quarter and first half of 1917, but the mills ask stiff advances for such contracts. Output and shipments are heavy, and all the mills are back in deliveries. We quote: Iron-finished tire, ½ x 1½ in. and larger, 2.60c., base; under ½ x 1½ in., 2.75c.; planished tire, 2.75c.; smooth channel tire, ¾ to ¾ and 1 in., 2.85c. to 2.90c.; 1½ in. and larger, 3.10c.; toe calk, 3.10c. to 3.15c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes, tapered or bent, 3.25c. to 3.35c.; spring steel, 3.25c. to 3.50c.; machinery steel, smooth finished, 2.90c. to 3c., all f.o.b. at mill.

**Hoops and Bands.**—The new demand is active, but most consumers are covered over the remainder of this year. Specifications are heavy. The leading maker states it is not taking any business in either hoops or bands as yet for 1917 delivery. Steel hoops are firm at 3c., and bands at 2.60c., with extras on the latter as per the steel bar card.

**Wrought Pipe.**—Reports that the Standard Oil Company had placed an order for 500 miles of line pipe with an Eastern mill are not confirmed here. However, John G. Pew, president of the local Peoples Natural Gas Company, which is a Standard Oil interest, was recently in California looking into a very large oil project, and it is possible the reported order was in connection with that proposition. The Peoples Natural Gas Company is in the market for 20 miles of 20-in. steel pipe, and a further inquiry is reported for 100 miles of 6-in. for an oil line running from the Oklahoma fields. The new demand for pipe is fairly heavy, but most consumers are covered ahead for some time. The mills are sold up on lap-weld pipe and oil-country goods for five to six months, but on butt-weld sizes of iron and steel pipe they can make fairly prompt shipments. The higher prices recently adopted by the mills on black iron and steel pipe are firmly held.

**Boiler Tubes.**—The new demand is heavy, but mills are filled up so far ahead that they cannot promise deliveries inside of eight to ten months on either locomotive or merchant tubes. On seamless steel tubing the two local makers are filled up until late next year. It seems that the present capacity for making seamless steel tubes is inadequate to meet the demand, but the situation will be relieved to some extent when the additions now under way at the plant of the Shelby Steel Tube Company, Ellwood City, Pa., have been completed.

**Coke.**—Inquiries are in the market for blast-furnace coke for the first half of next year and one contract for about 10,000 tons per month of high grade coke has been closed for that delivery at \$3 per net ton at oven. It is expected that other contracts will be closed early in October. Indications favor higher prices for furnace coke for the first half of next year than ruled in the second half of this year. The demand for prompt furnace coke is active, and high grades readily bring \$3 and in some cases \$3.10 and in a few instances \$3.25 per net ton at oven. We note sales of 10 carloads at \$3.10 and about 35 carloads at \$3.25, the latter for shipment to Youngstown. We quote prompt furnace coke at \$3 to \$3.10 and contract at \$2.85; best grades of 72-hr. foundry, \$3.25 to \$3.50 for prompt and \$3.50 to \$3.75 on contracts.

**Old Material.**—The local scrap market has improved. The demand is slightly better and prices on some grades are higher. The scarcity in supply of basic pig iron and the higher prices ruling for it, also the scarcity in the available supply of steel-making scrap and of common labor in scrap yards, are given as the main rea-

sons for the better condition of the market. Large consumers are not yet in as active buyers, nor are dealers trying to force sales, as they believe prices on nearly all grades of scrap will be higher in the very near future. Part of the Pennsylvania Railroad heavy steel scrap was sold at \$16, Altoona, and \$16.50, Pitsburgh, Pa. Prices on turnings are a little better, also on low phosphorus melting scrap. We note sales of 500 tons of heavy steel scrap at \$16.50; 100 tons at \$17; 500 tons of turnings at \$7.50; 1000 tons of borings at \$8.50; 1000 to 1500 tons of low phosphorus melting stock at \$20.50, and 2000 to 2500 tons at \$21, all per gross ton, delivered to buyers' mills. Prices now being quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Breckenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$16.50 to \$17.00
No. 1 foundry cast	15.00 to 15.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	18.00 to 18.50
Hydraulic compressed sheet scrap	13.50 to 14.00
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	11.00 to 11.25
Bundled sheet stamping scrap	10.50 to 10.75
No. 1 railroad malleable stock	15.00 to 15.25
Railroad grate bars	11.00 to 11.25
Low phosphorus melting stock	20.50 to 21.00
Iron car axles	34.00 to 35.00
Steel car axles	35.00 to 36.00
Locomotive axles, steel	38.00 to 39.00
No. 1 bushing scrap	13.50 to 13.75
Machine-shop turnings	7.25 to 7.50
Old carwheels	14.00 to 14.25
Cast-iron borings	8.50 to 9.00
*Sheet bar crop ends	18.50 to 19.00
No. 1 railroad wrought scrap	18.50 to 18.75
Heavy steel axle turnings	10.00 to 10.25
Heavy breakable cast scrap	12.50 to 12.75

\*Shipping point.

## Chicago

CHICAGO, ILL., Sept. 26, 1916.

Car buying that will call for nearly 60,000 tons of steel, delivery of which is more than likely to run into the second half of 1917, contributed to another week of great activity. Building contractors also were eager to close for the structural and reinforcing steel that would go into work which must be completed before the winter season sets in, and sales of rail-carbon bars and of fabricated steel, in large number, were the result. New inquiry for rails for export has also appeared, including 20,000 tons for France. The demand for sheets, both black and galvanized, from foreign and domestic users alike, was much heavier than it has been and is increasing. In nearly all directions the desire to buy is urgent and seemingly unrestrained. The problem of accommodating customers is correspondingly more complex. Pig iron continues to sell freely and, though actual advances in price appear to be realized with difficulty, producers are finding themselves able much more easily to secure the full market price for their product. Heavier buying of malleable iron made its appearance last week to augment the sustained activity in foundry and charcoal irons. With respect to rolling-mill and foundry grades of scrap, the market last week was even more quiet than it has been, but the long anticipated buying assumed a measure of reality in the sales of steel scrap and re-rolling rails. Prices of old car axles are again soaring.

**Pig Iron.**—The buying movement in pig iron continues in full swing, extending itself over a wider market and without apparent lessening of momentum. Melters of malleable iron began to participate more freely last week, and a number of sales of lots of 1000, 2000 and more tons are reported. There appears to have been little difficulty in securing the full price of \$19 at furnace. A sale of 2500 tons of basic was also made at the same figure. For business in southern Illinois, local furnaces found strong competition from producers in the Ironton district, competition which, in some instances, was successful in securing business at prices equivalent to concessions of from 25c. to 40c. per ton below the Chicago furnace price of \$19.

Southern iron is still the important factor in determining the price of foundry iron. High phosphorus Southern iron, of No. 2 grading in the matter of silicon, sold as low as \$17.75, Chicago, and Northern high phosphorus iron as low as \$18, delivery being for the remainder of this year and first quarter of 1917. While it is possible that prices as low as these might be duplicated, the quotations of the larger Southern producers are distinctly higher. Some of the higher phosphorus Southern irons can be had for fourth quarter delivery on the basis of \$18.25, Chicago, where advantage is taken of barge delivery, but for all-rail shipment these interests are asking a minimum of \$14.50 at furnace. This latter price can doubtless be done on some Southern irons for first half shipment, though \$15 is more commonly asked. Buying of foundry iron has continued freely, transactions in northern Indiana, southern Illinois and southern Wisconsin including a number of purchases of 1000 to 2000 tons, as well as many other smaller lots. Charcoal iron sales in the past few weeks have been at a rate equaling the activity of the early summer. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	\$19.75
Lake Superior charcoal, No. 1	20.25
Lake Superior charcoal, No. 6 and Scotch	20.75
Northern coke foundry, No. 1	\$19.00 to 19.50
Northern coke foundry, No. 2	18.00 to 19.00
Northern coke foundry, No. 3	18.00 to 18.50
Southern coke, No. 1 f'dry and 1 soft	18.50 to 19.00
Southern coke, No. 2 f'dry and 2 soft	18.00 to 18.50
Malleable Bessemer	19.00
Basic	19.00
Low phosphorus	34.00
Silvery, 8 per cent	29.50
Bessemer ferrosilicon, 10 per cent	32.50

**Rails and Track Supplies.**—A renewal of rail inquiry from abroad includes a new lot of 20,000 tons for France. The accommodation of this business is still unsolved so far as local mills are concerned. An Ohio railroad also is in the market for 5000 tons. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, \$50, f.o.b. mill net ton; standard section Bessemer rails, Chicago, \$33, base; open-hearth, \$35; light rails, 25 to 45 lb., \$40; 16 to 20 lb., \$41; 12 lb., \$42; 8 lb., \$43; angle bars, 2c., Chicago.

**Structural Material.**—Negotiations for cars were completed in several instances last week, a total exceeding 5000 being bought. For this equipment orders have been placed covering nearly 60,000 tons of steel, delivery of which will extend, at least in part, into the second half of 1917. Among the orders placed was one for 4000 gondolas and box cars, taken by the American Car & Foundry Company for the New York Central. The Nickel Plate also ordered 500 underframes. New proposals include 1000 to 2000 gondolas for the Western Maryland, 1000 automobile cars for the Missouri Pacific and 500 underframes for Armour & Co. In addition several smaller lots are under consideration. The limited season of weather favorable for building now remaining is putting pressure upon buyers of structural steel, evidence of which appears in the closing of an unusually large number of small contracts with fabricating shops. An aggregate of 3100 tons is reported, covering some 11 contracts, among which are included 800 tons of bridge steel for the Vandalia Railroad Company, 500 tons for an extension to the Soo Line ore dock at Superior, Wis., taken by the American Bridge Company, 400 tons for a Chicago Dock & Canal Company building taken by the Hansell-Elcock Company, and 360 tons for the Anaconda Copper Mining Company at Butte, Mont. The Kansas City Structural Steel Company took a contract for 225 tons while the other contracts ranged in size from 100 to 200 tons. We quote for Chicago delivery of structural steel from mill 2.789c.

We quote for Chicago delivery of structural steel out of jobbers' stock, 3.25c.

**Plates.**—The prices of plates and the conditions attending their delivery grow more extreme. Reports in-



dicate that wide plates for prompt shipment have been sold at prices in excess of 4c., Pittsburgh, and there seems to be no difficulty in securing 4c. for any delivery the mills are willing to quote. The opportunities of securing narrow plates, both for prompt and future delivery, are not so limited nor are prices so high. Sales at 3.25c., Pittsburgh, for prompt shipment and at 3c. for first half are noted. Where widths exceed 72 in., however, the market narrows rapidly. There is little diminution in demand. We quote for Chicago delivery of plates from mill, at its convenience, 3.189c. For prompt shipment we quote 3.439c. to 3.689c. in widths up to 72 in., and for wide plates 4.189c.

We quote for Chicago delivery of plates from jobbers' stocks, 3.75c.

**Sheets.**—Demand for both black and galvanized sheets has markedly increased in the past week, both from foreign and domestic sources. Inquiry from abroad for lots of 500 to 5000 tons involves a large aggregate quantity, but in this market little consideration is given to business other than that calling for shipment via Pacific coast ports. The improvement in domestic demand is equally impressive. While one large order was taken last week on the basis of 2.85c. for one-pass sheets, the majority of sales were made at a minimum of 2.90c., other prices ranging upward to 3.10c. Galvanized sheets have been selling more freely. One inquiry for export calls for 5000 tons of galvanized sheets. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.189c. to 3.339c.; box annealed, No. 17 and lighter, 3.039c. to 3.189c.; No. 28 galvanized, 4.389c. to 4.439c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.25c.; No. 28 galvanized, 4.65c. to 4.70c.

**Bars.**—Sales of rail-carbon steel for reinforcing purposes have been much heavier in the last fortnight, the crowding of concrete construction being largely responsible. The rerolling mills have at this time a larger tonnage on their books than at any other period in the year. An increase is also noted in the sales of bar iron, and the disposition to ask an advance of \$1 per ton is more general. At the Inland mill of the Republic Iron & Steel Company a labor strike is curtailing production. We quote mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.789c.; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.25c.; bar iron, 3.25c.; reinforcing bars, 3.25c. base with 5c. extra for twisting in sizes  $\frac{1}{2}$  in. and over and usual card extras for smaller sizes; shafting net list.

**Rivets and Bolts.**—Several of the mills still have a small quantity of bolts and nuts to sell, but they are picking their customers, as their position warrants them in doing. In rivets,  $\frac{1}{2}$  in. and larger, there is little activity, most of the users being under contract, but for small rivets the demand exceeds the supply as a result of the scarcity of wire rods. We quote as follows: Carriage bolts up to  $\frac{3}{4}$  x 6 in., rolled thread, 50-5; cut thread, 40-10-2 $\frac{1}{2}$ ; larger sizes, 35-2 $\frac{1}{2}$ ; machine bolts up to  $\frac{3}{4}$  x 4 in., rolled thread, with hot pressed square nuts, 50-10; cut thread, 50; large size, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, \$2.70 off per 100 lb.; hexagon, \$2.70 off. Structural rivets,  $\frac{3}{4}$  to 1 $\frac{1}{4}$  in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 4c.; boiler rivets, 4.10c.; machine bolts up to  $\frac{3}{4}$  x 4 in., 50-10; larger sizes, 40-10; carriage bolts up to  $\frac{3}{4}$  x 6 in., 50-5; larger sizes, 40-5; hot pressed nuts, square, \$3.25, and hexagon, \$3.25 off per 100 lb.; lag screws, 55.

**Wire Products.**—Inquiry for wire products in large amounts is being turned aside by the mills. Two of the important Western railroads have been seeking to place contracts, as yet, it is understood, without success. There is also an inquiry for 5000 tons of rods in this market, which has already brought refusals to quote from at least two mills. The retail and jobbing trades continue persistent in their demand for nails and barb wire. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, \$2.839; wire nails, \$2.789; painted barb wire, \$2.939; galvanized barb wire, \$3.639; polished staples, \$2.939; galvanized staples, \$3.639; all Chicago.

**Cast-Iron Pipe.**—Lettings of pipe in the last week have been, with one exception, very small. At Chicago, award has been made to contractors of 700 tons of special pipe. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$34.50; 6 in. and larger, \$31.50, with \$1 extra for Class A water pipe and gas pipe.

**Old Material.**—Buying of heavy melting and of shoveling steel by one of the largest local consumers was the only activity of consequence on the part of melters, and prices have shown little added strength as compared with the quotations of a week ago. In fact, shoveling-steel prices are somewhat easier. Car axles again provide the spectacular feature of the market, recent purchases by dealers having been made at prices ranging from \$32 to \$34 per ton. At this level, local users of axles cannot be interested, as they are able to buy so-called discard billets at \$25 to \$30, finding them of approximately similar analysis, and preferable in some respects to axles. The axles obviously are being gathered in for shipment elsewhere. Some betterment in the price of pipes and flues is also noted, and rails, both short and rerolling, are higher. Aside from the buying of steel scrap, including some 3000 tons of rerollers, the situation was even quieter last week than it has been. Offerings of railroad scrap embrace a larger quantity than has recently been listed, and include 6000 tons from the Great Northern, of which 2000 tons is steel rail, 3000 tons from the Burlington, and 3500 tons from the Rock Island. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$19.25 to \$19.75
Relaying rails	19.50 to 20.50
Old carwheels	11.75 to 12.25
Old steel rails, rerolling	17.75 to 18.25
Old steel rails, less than 3 ft.	18.25 to 18.50
Heavy melting steel scrap	16.25 to 16.75
Frogs, switching and guards, cut apart	16.25 to 16.75
Shoveling steel	15.50 to 16.00
Steel axle turnings	8.75 to 9.25

Per Net Ton	
Iron angles and splice bars	\$18.75 to \$19.00
Iron arch bars and transoms	20.50 to 21.00
Steel angle bars	15.25 to 15.75
Iron car axles	30.00 to 30.50
Steel car axles	32.50 to 33.50
No. 1 railroad wrought	16.50 to 17.00
No. 2 railroad wrought	15.50 to 16.00
Cut forge	15.50 to 16.00
Pipes and flues	12.25 to 12.75
No. 1 busheling	14.00 to 14.50
No. 2 busheling	9.50 to 10.00
Steel knuckles and couplers	14.75 to 15.00
Steel springs	15.25 to 15.50
No. 1 boilers, cut to sheets and rings	10.25 to 10.75
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	21.50 to 22.00
Machine-shop turnings	5.50 to 6.00
Cast-borings	6.50 to 7.00
No. 1 cast scrap	12.25 to 12.75
Stove plate and light cast scrap	9.75 to 10.25
Grate bars	10.00 to 10.25
Brake shoes	9.75 to 10.25
Railroad malleable	11.50 to 12.00
Agricultural malleable	11.00 to 11.50

## Philadelphia

PHILADELPHIA, PA., Sept. 26, 1916.

The largest Eastern buyer of basic pig iron has purchased 56,000 tons, while other consumers have taken at least 5000 tons, making the total of known transactions 61,000 tons, at prices ranging from a little less than \$20 to \$20.25, delivered, first half delivery. Low phosphorus has been active also, and in the past two weeks probably 30,000 tons has been taken under contract for first half delivery. Foundry iron shows little change, but several of the furnaces are well sold ahead and the trade is optimistic. In steel products the situation is stronger and a shortage of semi-finished steel is evident. The tremendous demand for plates continues to tax the mills and their sales forces, and large quantities are being booked at 4c., Pittsburgh base, though proffers of business are frequently declined. Some plate inquiries have been withdrawn, either because of price or unsatisfactory delivery. Shipyards are still seeking assurances from the mills, but at least one of the latter will not quote until it knows what tonnage it will be expected to furnish for Government work. Structural material is in lively de-

mand despite the lack of new building enterprises. Export agents continue to look for billets, but with little success so far as the larger mills are concerned. Old material still drags, although the feeling is a little better.

**Pig Iron.**—Orders for 56,000 tons of basic have been placed by the Lukens Iron & Steel Company, Coatesville, Pa., delivery to be in the first half. The iron was apportioned among four or five furnaces, and for the bulk of it \$20, delivered, will be paid, although for a part less than \$20 was accepted. At least 10,000 tons will come from the South. Another interest bought 3000 tons of basic at a little under \$20, delivered, while another lot of 2000 tons was taken at \$20.25. Low phosphorus continues active. In the past two weeks 25,000 to 30,000 tons has been purchased, mostly for 1917 delivery, half of the quantity taken having been contracted for in the past week. Most of the buying has been at \$35, delivered, and up to \$36 is now asked, the exact figure depending on terms, deliveries and specifications. Foundry iron does not show strength proportionate to that of steel-making grades, but its producers are optimistic as to the future. Eastern Pennsylvania No. 2 X is quoted at \$19.50 to \$20, delivered, with \$20 near the general market, although some sellers ask around \$20.25, delivered, and are unwilling to sell under this figure, a stand supported by their well-sold-up condition. The representative of a Southern producer on Saturday last had inquiries before him amounting to 9000 tons, and since has sold about 5000 tons. For No. 2 Southern this maker quotes \$14.50, furnace, for this year, but will not consider under \$15 for first quarter. The quotations for Virginia iron are now uniform at \$20.50 for No. 1, \$20.25 for No. 2 X and \$20 for No. 2 plain, all delivered. Fewer restrictions are imposed on deliveries, although the producers would like to make contracts which would equalize their deliveries. Orders for 3600 tons were booked by one producer in the week. In foundry iron the largest inquiry comes from the Baldwin Locomotive Works, which is in the market for 6000 tons of No. 2 X and other grades. The Pennsylvania Railroad is inquiring for 300 tons. Most of the inquiries are for small or moderate-sized quantities, mainly for first quarter. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry.....	\$19.50 to \$20.00
Eastern Pa. No. 2 plain.....	19.25 to 19.75
Virginia No. 2 X foundry.....	20.25
Virginia No. 2 plain.....	20.00
Gray forge.....	18.50 to 19.00
Basic.....	19.75 to 20.25
Standard low phosphorus.....	35.00

**Iron Ore.**—The only arrival of foreign ore reported in the week ended Sept. 23 consisted of 6742 tons from Sweden. An eastern Pennsylvania furnace has contracted for 15,000 tons of non-Bessemer Lake Superior ore at 40c. over the recent market.

**Fluorspar.**—Consumers have been active for 1917 delivery, and contracts for several thousand tons have been closed at about \$7 at the mines.

**Plates.**—The situation continues to grow more acute, but still there exists the puzzling disparity of prices. Most of the mills quote 4c., Pittsburgh, or 4.159c., Philadelphia, delivery at their convenience, yet one interest continues to quote 3c., Pittsburgh, or 3.159c., Philadelphia, as its minimum. An Eastern mill took an order for 1000 tons, for first quarter shipment to Canada, at 3.75c., Pittsburgh, while the best that could be done for a similar quantity of ship plates, also for Canada, was 4c., Pittsburgh. One mill would not consider an inquiry for 7500 tons, for delivery in the last half, at any price, but made a contract for 12,000 tons, running into the first quarter, at 4c., Pittsburgh, or 4.159c., Philadelphia. A lot of 2500 tons was booked at the same price and delivery. Another maker took a lot of 6000 tons of ship plates at 4.159c., Philadelphia, first quarter. A large aggregate of inquiry is outstanding, although some that was in hand a week ago has been withdrawn because of deliveries or prices. The private yards which are to build war vessels continue to seek data as to prices and available supply, having until Oct. 25 to submit their estimates to the Government.

Some of the mills are unwilling to give blanket quotations, inasmuch as they desire to know just what tonnage they will be called on to supply. Business from railroad carbuilders has appeared in the week.

**Ferroalloys.**—Eighty per cent ferromanganese is nominally around \$164 for first half, and in limited quantities for prompt shipment, although by some \$165 is quoted. Blast-furnace ferrosilicon is quoted at \$34.44, Philadelphia, for 11 per cent, and standard 50 per cent at \$86 to \$88, Pittsburgh. The arrival last week of 50 tons of English ferromanganese is reported.

**Bars.**—The nominal quotation on steel bars is unchanged at 2.759c., Philadelphia, but premiums are easily obtainable. The mills could dispose of a large tonnage if they had it to offer. They are not seeking to make contracts. Iron bars are strong at 2.659c., Philadelphia.

**Structural Material.**—New building projects, and action on those before the trade, are wanting, but material continues to be demanded from many sources, and it is scarce. The minimum quotation for structural shapes is 2.759c., Philadelphia, from which the price ranges up to 3.159c. One mill asks 3.659c. for ship shapes.

**Billets.**—Quotations for open-hearth rerolling billets range from \$48 to \$55, Eastern mill, the latter price having been paid. Forging billets are unchanged at \$65. Representatives of foreign consumers are actively looking for large tonnages of billets, especially for forging. Large makers are not quoting.

**Sheets.**—The market is easier. No premiums are asked, and eastern Pennsylvania makers will accept business at 3.159c. to 3.409c., Philadelphia. Recent large export inquiries did not come to fruition, while domestic inquiry is lighter.

**Coke.**—For prompt foundry coke some makers will not consider under \$3.50 per net ton at oven. Prompt furnace is quoted at \$2.80 to \$3 per net ton at oven, and contract at \$2.50 to \$2.60. Prompt foundry ranges from \$3.25 to \$3.50 per net ton at oven and contract at \$3.15 to \$3.40. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

**Old Material.**—Heavy melting steel continues quiet, though a better undertone is caused by buying in other districts. Wrought-iron pipe is stronger at \$15.50 to \$16. Cast borings are becoming scarce. Railroad wrought is in fair demand. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$14.75 to \$15.25
Old steel rails, rerolling.....	18.00 to 18.50
Low phos. heavy melting steel scrap..	21.25 to 23.50
Old steel axles (for export).....	35.00 to 36.00
Old iron axles (for export).....	35.00 to 36.00
Old iron rails.....	20.00 to 20.50
Old carwheels.....	15.50 to 16.00
No. 1 railroad wrought.....	21.00 to 22.00
Wrought-iron pipe.....	15.50 to 16.00
No. 1 forge fire.....	12.00 to 12.50
Bundled sheets.....	12.00 to 12.50
No. 2 busheling.....	10.50 to 11.00
Machine-shop turnings.....	7.50 to 8.00
Cast borings.....	9.50 to 10.00
No. 1 cast.....	16.00 to 16.50
Grate bars, railroad.....	11.75 to 12.25
Stove plate.....	11.75 to 12.25
Railroad malleable.....	13.50 to 14.00

Steel merchant vessels building or under contract to be built in private American shipyards, on Sept. 1, 1916, according to builders' returns to the U. S. Bureau of Navigation, were 397 of 1,292,310 gross tons. In August, 20 new vessels of 75,060 gross tons were contracted for and 12 vessels of 35,166 gross tons were completed. In the 7 months from Feb. 1 to Sept. 1, 1916, American yards contracted to build 229 steel vessels of 576,857 gross tons and completed 55 such vessels of 206,545 gross tons.

The Bethlehem Steel Company is reported as having an excellent chance of receiving a contract for the construction of 10 vessels for the government of Argentina, to cost about \$25,000,000.



## Cincinnati

CINCINNATI, OHIO, Sept. 27, 1916.—(By Wire.)

**Pig Iron.**—Virginia irons have again appeared in this market and a sale of 1000 tons was made to an Indiana melter for shipment commencing Oct. 1 and extending to March 1. Other smaller sales are also reported for delivery this year. Northern foundry iron has again been advanced by a large producer in the Hanging Rock district, and \$19, Ironton, is minimum for shipment in the last half of this year, orders for first half movement being accepted at the same figure. Southern iron is a little stronger, and while \$14, Birmingham basis, can be done on resale iron for prompt shipment, it is questionable whether any of the furnaces would book good-sized orders at this price. A number of Southern furnaces are quoting \$15 for first half shipment and are not disposed to take any business below this. A sale of 3000 tons of Southern foundry iron for first half delivery was made in Pittsburgh territory last week. Other Southern iron sales include one 600-ton lot in central Ohio, and Indiana melters also bought quite freely but no large tonnages are involved. Lake Superior charcoal has been especially active. Two consumers in central Ohio contracted for 500 and 1000 tons respectively for first half shipment. Ohio silvery irons are also showing considerable activity, and a sale of 1200 tons to a Michigan melter was made last week. Ohio high silicon irons, on the basis of 8 per cent, are quoted at \$27 to \$29 at furnace. Reports received from branch offices in St. Louis territory indicate heavy buying of foundry iron in that district. It is reported, but not definitely confirmed, that a nearby melter has contracted for 15,000 tons of basic iron for first half delivery. Eased on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	\$17.90 to \$18.40
Southern coke, No. 2 f'dry and 2 soft.	17.40 to 17.90
Southern coke, No. 3 foundry.	16.90 to 17.40
Southern coke, No. 4 foundry.	16.40 to 16.90
Southern gray forge	15.90 to 16.40
Ohio silvery, 8 per cent silicon	28.26 to 28.76
Southern Ohio coke, No. 1.	21.26 to 21.76
Southern Ohio coke, No. 2.	20.26 to 20.76
Southern Ohio coke, No. 3.	19.76 to 20.26
Southern Ohio malleable Bessemer.	20.26 to 20.76
Basic, Northern	20.26 to 20.76
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel	24.90 to 25.40

## (By Mail)

**Finished Material.**—Warehouse quotations on structural shapes, steel bars and plates have been advanced. Steel bars from stock are now quoted at 3.35c. base; twisted steel bars, 3.50c., the 2-in. and larger sizes being held at 3.90c.; No. 28 galvanized sheets, strong at 4.65c., Cincinnati or Newport, Ky.; No. 28 black sheets, 3.15c. to 3.25c.; No. 10 blue annealed sheets, 3.15c. to 3.25c.; wire nails, \$2.85 per keg base; barb wire, \$3.70 per 100 lb. The sheet mills report a heavy demand for both black and galvanized and are now more interested in taking care of old customers than in obtaining new business. The warehouse deliveries on some classes of material are a little easier, although mill shipments are still delayed. Cold rolled shafting is hard to obtain even for shipment in the first half of next year.

**Coke.**—Prices are firm, although there is little new contracting except for scattered lots of foundry coke that are needed for filling in. Shipments are going forward at a more satisfactory rate. The car shortage has not been serious enough to cause any great inconvenience. Connellsville furnace coke remains around \$2.70 to \$2.85 per net ton at oven for nearby shipment and \$2.50 to \$2.85 for yearly contracts. Wise County and Pocahontas brands are quoted about 15c. a ton higher. Foundry coke is selling around \$3.50 to \$3.60 per net ton at oven for either prompt or future shipment, except New River, which is quoted at \$3.90 to \$4 at oven.

**Old Material.**—An advance of approximately 25c. per ton has been made on all grades of scrap except borings and turnings. The rolling mills are taking a larger quantity of scrap iron than they have for some time, and the foundry consumption is also on the in-

crease. The following are dealers' prices f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton	
Bundled sheet scrap	\$11.50 to \$12.00
Old iron rails	16.50 to 17.00
Relaying rails, 50 lb. and up.	21.75 to 22.25
Re-rolling steel rails	15.50 to 16.00
Heavy melting steel scrap	15.00 to 15.50
Steel rails for melting	14.00 to 14.50
Per Net Ton	
No. 1 railroad wrought.	\$14.75 to \$15.25
Cast borings	4.50 to 5.00
Steel turnings	4.75 to 5.25
Railroad cast	12.00 to 12.50
No. 1 machinery cast	13.75 to 14.25
Burnt scrap	9.00 to 9.50
Iron axles	26.75 to 27.75
Locomotive tires (smooth inside)	21.75 to 22.25
Pipes and flues	10.00 to 10.50
Malleable and steel	11.75 to 12.25
Railroad tank and sheet.	9.25 to 9.75

## Buffalo

BUFFALO, N. Y., Sept. 26, 1916.

**Pig Iron.**—Inquiry in the last two days has been for a total of upward of 25,000 tons for foundry, malleable and special irons, and mostly for first quarter needs. Prices remain rigidly at \$19 to \$20, and one or two producers have announced that they have to-day advanced their minimum for any grade to \$19.50 at furnace. Foundry and malleable grades appear to be in somewhat more active demand than basic. Out of a total of 12,000 tons reported as placed for the week, about two-thirds was for foundry and malleable grades and one-third for basic. One purchasing interest came into the market with urgent demand for 250 or 300 tons of foundry iron, but only a single carload could be obtained for the delivery required. We quote as follows, f.o.b. furnace, Buffalo, for delivery to and including the first half of 1917:

No. 1 foundry	\$19.50 to \$20.00
No. 2 X foundry	19.00 to 19.50
No. 2 plain	19.00 to 19.25
No. 3 foundry	19.00
Gray forge	19.00
Malleable	19.25 to 19.50
Basic	19.50 to 20.00
Bessemer	22.00
Charcoal, regular brands and analysis	21.00 to 22.00

**Old Material.**—Prices for some commodities have been advanced. Heavy melting steel is now held at \$16 to \$16.50, and some sales have been made on a basis of \$17. No large amounts are available at these figures at this time. Indications point to a steady rise. A scarcity of labor prevents scrap yards from putting scrap in shape for charging-box size. Strong demand for low phosphorus steel has developed, and the price has advanced \$1 per ton. Railroad and machinery cast scrap is also in good demand, with a price advance of 50c. per ton. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	\$16.00 to \$16.50
Low phosphorus steel	21.00 to 21.50
No. 1 railroad wrought scrap	17.50 to 18.00
No. 1 railroad and machinery cast scrap	16.00 to 16.50
Steel axles	32.00
Iron axles	32.00
Carwheels	13.00 to 13.50
Railroad malleable	15.50 to 16.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	12.00
Clean cast borings	7.50 to 7.75
Iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	12.00 to 12.50
Bundled sheet scrap	11.50 to 12.00
No. 1 busheling	13.00 to 13.50
No. 2 busheling	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

**Finished Iron and Steel.**—Mills are compelled to choose the business they are accepting. Several agencies report they are sold up on bars and small shapes for 10 to 12 months ahead. Demand has been heavy for structural material, and much that has been placed will be shipped in April or May in time for the spring demand. There is a great scarcity of wire rods; on a recent inquiry for a 1000-ton lot, a price of \$62.75 per gross ton was quoted with considerable reluctance by the mill offering it. Washers are strong at \$6 to \$6.10 off, at mill. On pipe, jobbers' stocks are in fairly

good condition so far as butt-weld pipe is concerned, but it is very difficult to keep stocks up on lap weld sizes. Prices for fabricated structural steel are strong. Architect G. Morton Wolfe, Buffalo, is taking bids for 317 tons for the Rice & Adams Dairy Machinery Company, Buffalo; architects Colson & Hudson, for 100 tons for the Peeriess Laundry, Buffalo; and Manion Brothers, Rochester, for 100 tons for a New York Central freight house at Lockport. Bids for an 800 to 900-ton bascule bridge to be erected over the Buffalo River, at Abbott Road, will not yet be opened, as new bids are to be called for permitting competitive designs.

## Cleveland

CLEVELAND, OHIO, Sept. 26, 1916.

**Iron Ore.**—Two Eastern steel companies have made reservations for a large tonnage of Lake Superior non-Bessemer ore for next season delivery, agreeing to pay the regular market price to be established later, and other inquiries from the East are pending. With the present condition of the steel market the securing of a sufficient supply of ore of a high grade to permit the maximum blast furnace output appears to take precedence over the question of prices with the Eastern as well as the Western consumers, and this accounts for some of the early heavy reservations of the better grades of ores. Iron ore firms report sales of some small lots of ore for this season's delivery at regular prices, the buyer paying the additional wild carrying charges. We also note the sale for shipment this season of 50,000 tons of Mesaba ore that was made direct by one of the mining companies. According to an unconfirmed report this sale was made at an advance over this season's prices. We quote prices as follows, delivered lower Lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; old range non-Bessemer, \$3.75; Mesaba non-Bessemer, \$3.55.

**Pig Iron.**—The market has been very active and prices are higher on all grades. Cleveland furnaces have advanced quotations on foundry and malleable iron 50c. a ton to \$19, and one Cleveland interest has withdrawn from the market except for Cleveland delivery. Most Valley producers are now asking \$19 for foundry, malleable and basic iron and \$22 for Bessemer. A heavy tonnage of foundry and malleable iron was sold in this territory during the past few days, before the price advance, in lots of 1000 tons and over. A Bedford, Ohio, stove foundry has taken about 5000 tons of Northern foundry iron for first half from Cleveland furnaces at \$18.50 and is in the market for 1500 tons of 8 per cent silvery iron. Southern iron is also quite active and some additions have been made to the producers who are holding Southern iron at \$15, Birmingham, for first half. One sale of 1150 tons to a nearby consumer is reported at the \$15 price. Tennessee silvery iron is being offered at \$22, Birmingham, which makes the delivered price in this territory from \$2 to \$3 below Ohio silvery. We quote, delivered Cleveland, as follows:

Bessemer .....	\$22.70 to \$22.95
Basic .....	19.30
Northern No. 2 foundry .....	19.30
Southern No. 2 foundry .....	18.50 to 19.00
Gray forge .....	19.00
Jackson Co., silvery, 8 per cent silicon .....	28.62
Standard low phos., Valley furnace .....	33.00

**Coke.**—A Cleveland interest has purchased 13,500 tons of blast furnace coke, being half of its requirements for one stack for fourth quarter and is in the market for the remainder. The market is very firm and as high as \$3.25 per net ton at oven is being asked for furnace coke for prompt shipment and contract. Foundry coke is not active. Standard Connellsville brands are quoted at \$3.25 to \$3.50 for prompt shipment and contract.

**Finished Iron and Steel.**—There is considerable inquiry for small lots of steel both for prompt shipment and for such deliveries as the mills are able to make, the steel bar market being particularly active. Some fourth quarter contracts for Bessemer steel are being placed at 2.60c. for steel bars, these contracts includ-

ing structural material at 2.85c. and plates at 4c. Some additional first half contracts for steel bars have been taken from the implement trade at 2.50c., Pittsburgh. Steel bars for early shipment are quoted at 2.75c. to 3c. While 4c., Pittsburgh, is the minimum ruling price on plates for early shipment, plates in narrow sizes are being sold for early delivery as low as 3.10c. A Cleveland mill has sold to a local consumer over 10,000 tons of slabs for fourth quarter delivery at \$46, Cleveland. Considerable new inquiry is coming out for steel for railroad cars and locomotives. The Wheeling & Lake Erie is in the market for 2000 freight cars and the Nickel Plate is in the market for 1000 cars and 10 locomotives. Small lot sales of rails for prompt shipment aggregating 325 tons are reported at \$45. Considerable new demand is coming from fabricators for small lots of steel. The structural material for the new steel plant of the Cromwell Steel Company at Lorain, Ohio, requiring 2500 tons, will be furnished by the Eastern Steel Company. Delayed deliveries and high prices for structural material have caused considerable increase in the demand for reinforcing bars. Hard steel bars are weak, due to the plentiful supply rolled from shell discard and have sold as low as 2.30c., delivered Cleveland. Iron bars are firmer, now being quoted at 2.50c. to 2.60c., Cleveland. There is a good demand for charcoal iron boiler tubes due to the fact that consumers cannot get deliveries on steel tubes. The sheet market is fairly active and while most mills are quoting a minimum of 3c. for black sheets the 2.90c. price has not disappeared. We quote sheets at 2.90c. to 3.10c., Ohio mill, for No. 28 black; 2.90c. to 3c. for No. 10 blue annealed; and 4.15c. to 4.30c. for No. 28 galvanized. Local warehouse prices have been advanced \$3 a ton on steel bars, structural material and hoops and \$2 a ton on plates. New warehouse prices are 3.40c. for steel bars; 3.90c. for large rounds; 3.40c. for structural material; 3.75c. for plates; 3.90c. for hoops, and 3.25c. for iron bars.

**Bolts, Nuts and Rivets.**—Specifications which have been quiet for some time have increased and are now heavy in volume, and there is considerable inquiry for bolts for prompt shipment. Quite a demand has sprung up from the implement trade. Rivet prices are unchanged at 4c., Pittsburgh, for structural and 4.10c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts,  $\frac{3}{4}$  x 6 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and 2  $\frac{1}{2}$ ; larger or longer, 35 and 2  $\frac{1}{2}$ ; machine bolts within h. p. nuts,  $\frac{3}{4}$  x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 5; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, \$2.70 off the list; hexagon h. p. nuts, blank or tapped, \$2.70 off; c. p. c. and t. sq. nuts, blank or tapped, \$2.40; hexagon nuts, all sizes, \$2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

**Old Material.**—The market is dull but fairly firm. Local mills are well supplied with material and are not actively in the market. Sellers are asking higher prices than the mills are willing to pay and are making but little effort to move the material. A sale of heavy melting steel on track in Youngstown is reported at \$16.50. Busheling which was reported sold as high as \$13 has sagged back and mills are offering only \$12 for this grade. Borings and turnings are also weak. Heavy melting steel is strong and quotations on this grade are 25c. to 50c. a ton higher. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Steel rails .....	\$15.25 to \$15.75
Iron rails .....	18.50 to 19.00
Steel car axles .....	32.00 to 33.00
Heavy melting steel .....	16.25 to 16.75
Carwheels .....	12.75 to 13.00
Relaying rails, 50 lb. and over .....	25.00
Agricultural malleable .....	12.50 to 12.75
Railroad malleable .....	14.00 to 14.25
Steel axle turnings .....	12.00 to 12.50
Light bundled sheet scrap .....	12.00 to 12.25

Per Net Ton	
Iron car axles .....	\$24.00 to \$25.00
Cast borings .....	6.00 to 6.25
Iron and steel turnings and drillings .....	5.50 to 5.75
No. 1 busheling .....	12.00 to 12.25
No. 1 railroad wrought .....	15.50 to 16.00
No. 1 cast .....	13.00 to 13.50
Railroad grate bars .....	10.00 to 10.50
Stove plate .....	10.00 to 10.25



## Birmingham

BIRMINGHAM, ALA., Sept. 25, 1916.

**Pig Iron.**—Sales of pig iron this month have equaled the make in this district, over 30,000 tons having been placed during the third week alone. One of the smaller producers is sold practically to capacity for the remainder of the year and well into 1917. Bookings for the first half of 1917 were made for the larger part at \$14.50. The market has apparently hardened to this price as a minimum. A recent sale for Southern delivery embraced 1000 tons of No. 3 for last quarter and first quarter of 1917 each at \$14. Another maker sold 1000 tons of No. 2 soft for Western delivery in last and first quarters at \$15 and 1000 tons for first half, Southern delivery, at \$15. Two iron companies have advanced to \$15 on 1917 business, and the largest foundry-iron producer, after making heavy bookings, is on that basis, with indications of advancing still further in the near future. The leading maker has been selling at \$14.50 and \$15, according to quantity and other conditions of specifications, both for spot and forward, not declining 1917 business at the lower figure. Interest in export iron has declined, owing to the difficulty in securing ships. It is not now probable that any more furnaces will go on basic. The car shortage remains acute; in fact, it is responsible to a degree for the increase in free foundry iron on yards Sept. 1. Several export shipments have been made in the past two weeks and others are due in the near future. As low as \$15 ocean freight has been recently offered. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft.....	\$15.00 to \$15.50
No. 2 foundry and soft.....	14.50 to 15.00
No. 3 foundry.....	14.00 to 14.50
No. 4 foundry.....	13.75 to 14.25
Gray forge.....	13.50 to 14.00
Basic.....	14.50 to 15.00
Charcoal.....	22.00 to 22.50

**Cast-Iron Pipe.**—The most notable order received recently was for 1200 tons of 4-in. pipe for El Paso, taken by the leading interest. The movement of oil pipe from North Birmingham is proceeding regularly. Prices have advanced, and shipments are keeping pace with the production. We quote, per net ton, f.o.b. pipe shop yards, as follows: 4-in., \$29; 6-in. and upward, \$26, with \$1 added for gas pipe and 16-ft. lengths.

**Coal and Coke.**—Increasing activity of railroads and coal-using plants has stimulated the demand to such an extent that the output is regulated by the car supply. The demand for blacksmithing coal is strong, with prices at \$2.25 per ton for foundries and \$2 for railroads. Coke could hardly be more active. An order for 10,000 tons for Italy was declined on account of inability to fill it. Spot foundry coke brings as high as \$5 to \$5.25 per net ton at oven. On regular contracts prices for standard beehive, f.o.b. oven, remain at \$4 to \$4.25 and \$4.50. Furnace coke brings \$3.25.

**Old Material.**—A sale of 500 tons of cast scrap was made at \$11.50 the past week. Steel and wrought are fairly active and yards have little left. The Anniston steel works are taking a lot of Birmingham scrap. Prices are firmer. Steel axles, while not plentiful, frequently go under real value in mixed steel sales. The scrap market is much more promising. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old steel axles.....	\$25.00 to \$30.00
Old steel rails.....	11.50 to 12.00
No. 1 steel scrap.....	10.50 to 11.00
No. 1 wrought.....	12.50 to 13.00
No. 1 cast.....	11.00 to 11.50
Stove plate and light.....	8.75 to 9.25
Carwheels.....	11.50 to 12.00
Tram carwheels.....	11.00 to 11.50

A social club, started several months ago by a few employees of the Minneapolis Steel & Machinery Company, Minneapolis, Minn., and without suggestion from the management, has purchased a house and lot for its headquarters, according to the September issue of the company's *Bulletin*, which is an attractive thirty-page monthly magazine, setting forth the products of the company and the activity of its force.

## St. Louis

ST. LOUIS, MO., Sept. 25, 1916.

**Pig Iron.**—Purchases have been heavy, largely by the stove manufacturers. The aggregate of purchases made by local interests, Belleville and Quincy, Ill., and other points has reached 20,000 to 25,000 tons, chiefly of No. 2, with some No. 3 Southern and a little special analysis iron. Two were for 1000 tons each of No. 2 Southern and one of 1000 tons of Southern special analysis. At Belleville and at Quincy the purchases ran to probably 5000 tons in each instance. Transactions have been largely for first-half delivery. It is pretty well established that \$14.50 was the prevailing price.

**Coke.**—Very little business is reported in coke. The prices quoted here are stiffly held at present with the by-product coke of local plants on a parity with the Connellsville product.

**Finished Iron and Steel.**—The market has developed no new large tonnage contracts. Specifications are held up closely to contracts. Consumers appear willing to pay prices asked, whether from mills on late delivery or from the warehouses at retail quotations. For stock out of warehouse we quote higher prices as a result of the higher base figures at Pittsburgh. For warehouse stock we quote as follows: Soft steel bars, 3.30c.; iron bars, 3.20c. to 3.25c.; structural material, 3.30c.; tank plates, 3.80c.; No. 10 blue annealed sheets, 3.45c.; No. 28 black sheets, cold rolled, one pass, 3.40c.; No. 28 galvanized sheets, black sheet gage, 4.80c.

**Old Material.**—Quotations are well held as a result of the entry of consuming interests into the market coupled with the anxiety of dealers to cover shortage and also to provide against the future which they expect to bring higher prices. Mills are paying the higher prices asked for small lots rather unwillingly and are disinclined to take large lots. They regard prices as out of line with the figures of other markets. Railroad material is not coming out in sufficient quantity to weaken dealers' positions materially. Steel scrap is stronger than rolling mill grades, but the latter are well held. The approach of winter is also looked upon as likely to reduce offerings still farther. Lists out during the week included 4300 tons from the Great Northern, 300 tons from the Chicago & Alton, 2000 tons from the Nashville, Chattanooga & St. Louis, 300 tons from the Kansas City Terminal, 600 tons from the Vandalia, 3000 tons from the Burlington and 150 tons from a local industry. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails.....	\$17.50 to \$18.00
Old steel rails, rerolling.....	17.00 to 17.50
Old steel rails, less than 3 ft.....	17.00 to 17.50
Relaying rails, standard section, subject to inspection.....	23.00 to 24.00
Old carwheels.....	12.50 to 13.00
No. 1 railroad heavy melting steel scrap.....	16.00 to 16.50
Heavy shoveling steel.....	15.00 to 15.50
Frogs, switches and guards cut apart.....	15.75 to 16.25
Bundled sheet scrap.....	8.25 to 8.75

Per Net Ton	
Iron angle bars.....	\$17.25 to \$17.75
Steel angle bars.....	15.00 to 15.50
Iron car axles.....	27.50 to 28.00
Steel car axles.....	28.50 to 29.00
Wrought arch bars and transoms.....	22.00 to 22.50
No. 1 railroad wrought.....	16.50 to 17.00
No. 2 railroad wrought.....	16.00 to 16.50
Railroad springs.....	16.00 to 16.50
Steel couplers and knuckles.....	16.00 to 16.50
Locomotive tires, 42 in. and over, smooth inside.....	21.50 to 22.00
No. 1 dealers' forge.....	13.25 to 13.75
Cast-iron borings.....	7.25 to 7.75
No. 1 busheling.....	14.50 to 15.00
No. 1 boilers, cut to sheets and rings.....	10.50 to 11.00
No. 1 railroad cast scrap.....	12.50 to 13.00
Stove plate and light cast scrap.....	9.25 to 9.50
Railroad malleable.....	11.00 to 11.50
Agricultural malleable.....	10.00 to 10.50
Pipes and flues.....	11.00 to 11.50
Heavy railroad sheet and tank scrap.....	11.00 to 11.25
Railroad grate bars.....	10.00 to 10.50
Machine shop turnings.....	7.50 to 8.00

Helen furnace of the Red River Iron Works, Clarks-ville, Tenn., which has been producing ferrosilicon for the past five months, was blown out for relining Sept. 25. It will probably be in again late in October.

## New York

NEW YORK, Sept. 27, 1916.

**Pig Iron.**—There are some inquiries for foundry iron in New Jersey in lots of 500 to 1000 tons, but the foundry market is generally quiet. In New England, labor troubles have been a great handicap and foundries there seem to be pretty well supplied with iron. A New Jersey steel company bought 4000 tons of basic in the past week for first quarter, mostly high manganese iron. A pipe foundry has been a buyer for 1917 to the extent of 2000 or 3000 tons of No. 3 and No. 2 plain. Some low prices were made in this connection, which ordinarily would correspond to less than \$19 delivered for No. 2 X, with a 35 to 40 cent freight. However, furnaces are not naming as low a price on No. 2 X. One eastern Pennsylvania interest has advanced prices lately to \$20, furnace, for No. 2 X, but sales are not reported at that figure. Export iron still leads in interest. A sale of 3000 tons of low phosphorus for England was closed in the past week. There is also pending some low phosphorus for France and some Southern foundry iron for the Continent. Buffalo irons have not been particularly active. In view of their large sales in August and early September, furnaces in that district are disposed to ask \$19 for No. 2 X for the first half of next year. We quote at tidewater for early delivery: No. 1 foundry, \$20 to \$20.50; No. 2 X, \$19.50 to \$20; No. 2 plain, \$19.25 to \$19.50; Southern iron at tidewater, \$19.75 to \$20.25 for No. 1 and \$19.50 to \$19.75 for No. 2 foundry and No. 2 soft.

**Ferroalloys.**—Sales of about 5000 tons of domestic ferromanganese are reported for the past week, most of it going at \$165, delivered, or slightly less. About 300 tons of the British alloy was sold at \$164, seaboard. Some dealers report more active inquiry. Quotations generally are \$164, seaboard, to \$165, delivered, depending on whether domestic or foreign alloy is involved. Spiegeleisen is quiet at about \$45, furnace. A 300-ton sale of 16 to 19 per cent material was made this week. Bessemer ferrosilicon is in strong demand and quotations on the lower grades, 10 to 13 per cent, have been advanced \$1 per ton. The 10 to 11 per cent grade is quoted at \$31, furnace, the 11 to 12 per cent at \$32, and the 12 to 13 per cent at \$33. The 14 to 15 per cent alloy is selling at \$45 per ton, furnace. High-grade ferrosilicon is active with considerable new inquiry.

**Structural Material.**—The interesting view is expressed that we are on the eve of as big a buying movement by railroads, for bridge work at least, as has ever been known. Besides need for such work, the belief is that large expenditures can now be made and that such will minimize the forcing of wage advances, besides securing a measurable return for the money. General building work of large size is quiet at the moment, but demand for industrial plant additions is still a factor with all its urgency for prompt shipment. The fresh railroad offerings include 300 tons for the Philadelphia & Reading, covering 200 tons at Pottsville, Pa., placed with the Phoenix Bridge Company and the remainder with the McClintic-Marshall Company; 300 tons for two bridges for the Boston & Maine; and about 500 to 600 tons additional work for the Baltimore & Ohio. The Pennsylvania has closed in the last week or two on 2900 tons and has placed a freight house at Harrisburg, 200 tons, with the Phoenix Bridge Company. The Maine Central is expected to be in the market for 2000 to 3000 tons, and the Boston & Maine, it is believed, will ask for as much. Among industrial plants the closures embrace 1100 tons for the Whitney Glass Works, Glassboro, N. J., to the McClintic-Marshall Company; 700 tons for the E. C. Budd Mfg. Company, Philadelphia, to the Eastern Steel Company; 700 tons for two buildings for the General Electric Company, Lynn, Mass., to the Hedden Iron Construction Company; 240 tons for the Cramps shipyard to the Belmont Iron Company, and 200 tons for the Snellenberg department store, Philadelphia. Milliken Brothers has taken 300 tons for W. R. Grace & Co., Lima, Peru, and the Dominion Bridge Company 2500 to 3000 tons for the International Nickel Company, at Port Calbourne. It is stated that the Chester, Pa., power house

is about closed. Awards in general building lines include 1500 tons for the Racquet & Tennis Club to the American Bridge Company and 3500 tons for the sub-structure to the Paterno apartment building, probably awarded to the Jones & Laughlin Steel Company. A high school in Philadelphia taking 200 tons has been closed and a cathedral, involving 600 tons, for Newark, is up for figures. That city is also to take 500 tons for a bridge at Port Street. We quote mill shipments of plain structural material at 2.769c. to 3.019c., New York, and warehouse shipments, which have advanced \$2 per ton, at 3.35c., New York.

**Steel Plates.**—A buyer of ship material offered to pay 3.75c., Pittsburgh, for 48,000 tons of ship plates to be delivered in 1917, but the mill would not budge from 4c. At this writing the purchase has not been effected, though it is likely that the material will be used in large part at a Staten Island, N. Y., shipyard which has been acquired in this connection. One large domestic manufacturing consumer has bought 10,000 tons for the first quarter at 4c., Pittsburgh, and a boiler maker has closed for at least 1000 tons for the same delivery and price, though the tonnage was less than half what was desired. One live inquiry from Italy is for 15,000 tons. Small lots for immediate delivery are commonly done at 5c., Pittsburgh. Wide plates are practically not obtainable prior to the second quarter, and the market is minimum at 4c., Pittsburgh. Plates up to 7 ft. in width likewise take 4c., but deliveries may be made in 6 to 8 weeks, while universal plates are not in good demand and may be obtained in a few weeks and at 3.50c., Pittsburgh. Warehouse prices range from 4c. to 4.50c., New York.

**Iron and Steel Bars.**—Domestic buying is for the moment quiet, but export business appears to be on a decided upward trend, with opinions expressed that another buying movement is under way, the necessary interval having transpired since the last general export purchasing. On top of the earlier refusal of mills to consider contracts, buyers are now indifferent. In the face of possible higher prices they show every indication of planning to buy merely definite needs. Italy is prominent in the new export offerings and among other things is inquiring for 50,000 tons of billets for shell making. One export sale for 400 tons of flat and round bars is noted and 100 tons of nail wire sold 3.35c. f.a.s., New York. A limited amount of steel bars can apparently be obtained in the fourth quarter at 2.769c. minimum, New York, while the store price is now higher, or 3.35c., New York. Iron bars remain at 2.669c. and 3.25c., New York, respectively, for mill and warehouse shipments.

**Old Material.**—A better feeling prevails, which is partly due to the reappearance of a demand from western Pennsylvania and partly to increased buying by iron rolling mills. Eastern Pennsylvania consumers of steel scrap are either well stocked or are still prevented by embargoes from taking in shipments. Heavy melting steel scrap for Pittsburgh is now bringing \$14 to \$14.25, New York, but steel scrap intended for eastern Pennsylvania shows no advance from the figures of the past few weeks. Prices are higher on all kinds of rolling-mill stock, while borings and turnings at last show some tendency toward a higher level, due to a better demand from eastern Pennsylvania consumers. Brokers quote buying prices for the Eastern trade about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications) .....	\$11.75 to \$12.00
Old steel rails (short lengths) or equivalent .....	12.50 to 12.75
Relaying rails .....	28.50 to 29.00
Rerolling rails .....	17.50 to 18.00
Iron and steel car axles (for export) .....	38.50 to 39.00
No. 1 railroad wrought .....	19.75 to 20.00
Wrought-iron track scrap .....	16.75 to 17.00
No. 1 yard wrought, long .....	14.50 to 15.00
No. 1 yard wrought, short .....	11.75 to 12.00
Light iron (nominal) .....	3.50 to 4.00
Cast borings (clean) .....	7.00 to 7.50
Machine-shop turnings (nominal) .....	5.00 to 5.25
Mixed borings and turnings (nominal) .....	5.00 to 5.25
Wrought pipe .....	13.00 to 13.50

Foundries are buying steadily, but not in large



quantities. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery).....	\$15.75 to \$16.00
No. 2 cast (heavy).....	14.00 to 14.50
Stove plate.....	11.50 to 12.00
Locomotive grate bars.....	10.00 to 10.50
Old carwheels (nominal).....	15.00
Malleable cast (railroad).....	12.00 to 12.50

**Cast-Iron Pipe.**—General business is of moderate volume, marked by no heavy purchases, while municipal lettings are almost completely absent. Some of the largest private buyers of pipe are sounding the market for prices for delivery next year. Manufacturers are more willing to sell for delivery this fall than to take contracts for 1917, being quite confident that prices will attain a higher level in the not distant future. Carload lots of 6-in., class B and heavier, are firmly held at \$31.50 per net ton, tidewater, with \$1 per ton extra on class A and gas pipe.

## British Steel Market

### Hematite Iron in Strong Demand—Billets Sparingly Offered

LONDON, ENGLAND, Sept. 27, 1916.—(By Cable)

The Cleveland pig-iron market is firm with heavy bookings for France. Prompt iron is scarce and an increased output of hematite iron is urgently needed. Restrictions are unrelaxed. American billets are sparingly offered for fourth quarter, with buyers reticent. Two-inch billets for January to March delivery are quoted at £15, c.i.f. Liverpool, and wire rods for October delivery at £19 10s. Prices of tin plate are still quite irregular. Stock plates are quoted at 36s. We quote as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 33s. to 36s.
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20 5s.
Steel ship plates, Scotch, delivered local yards, £13 17s. 6d.
Steel rails, export, f.o.b. works, £10 17s. 6d.
Hematite pig iron, f.o.b. Tees, about 140s.
Sheet bars (Welsh) delivered at works in Swansea Valley, £10 7s. 6d.
Steel bars, export, f.o.b. Clyde, £18.
Ferromanganese (nominal), £35.
Ferrosilicon, 50 per cent, c.i.f., £27.

### Hematite Pig Iron Very Scarce—American Steel Scarce and High

LONDON, ENGLAND, Sept. 12, 1916.—(By Mail).—

The congestion of orders in the British steel industry is as great as ever, and the labor position is certainly far from satisfactory, in spite of all efforts made to organize the available forces and the introduction of female labor, where this can be done. There is no prospect of the scarcity being remedied until the war is over.

The most striking feature in pig iron is the extraordinary tightness of hematite, where the output is still considerably short of requirements, though urgent needs are being coped with. Export licenses have had to be suspended for a time in order to make up for some of the arrears on home account, while steel works running on munitions use up the greater part of the current output. In other brands the situation is well in hand. It is suggested that French consumers are now asking to have part of their specifications postponed against outstanding contracts, while the tonnage shipped last month showed a new high record. This, coupled with the fact that Italy is now drawing supplies from America, has afforded more facilities in other directions, and enabled a few cargoes to be shipped to Russia via Norway. The outlook causes less anxiety while the production is being slowly further increased.

Conditions in semi-finished steel on the other hand have grown more stringent, nothing being obtainable from home producers outside munition work or for special purposes, for which permits have to be secured from the Ministry of Munitions. American material has tightened further with France and Italy still inquiring for this year's shipments, but offers for any-

thing earlier than the closing months of the year have become very scarce, and the much stiffer terms quoted render business difficult. For 4-in. billets, up to \$68 and more is now being asked for the first quarter of next year, while wire rods are quoted £19 10s., c.i.f. Liverpool. Very high prices, too, are demanded for American finished material, small lots of steel bars being offered at £17, c.i.f. Liverpool for September-October.

There has been no important change in finished iron and steel, export business being paralyzed by the severe restrictions of war work although there is still a steady demand for various classes of material. The River Plate is now inquiring for cast-iron pipe, while similar business could be secured for South Africa. Black steel sheets are hard to get, due to the commandeering of steel by the government and the shortage of American sheet bars. Quotations are thus strongly maintained, while operations have to be restricted.

The demand for tin plate has slackened but the premium on stock plate is as stiff as ever, with the supply steadily diminishing. Fundamental conditions are critical, all indications pointing to a further weakening of the output. Prices continue extremely wide. While the price for stock plate ranges up to about 36s. basis 20 x 14, orders for plates to be made could probably be easily placed at about 28s. per box basis f.o.b.

### Germany's Steel Output for July

Germany's steel output for July, 1916, was 1,366,107 metric tons, or at the rate of 52,543 tons per day. This is next to the war record of 54,990 tons per day, or 1,319,762 tons in June. The largest war total for a month was 1,412,137 tons in May. The July output was made up of 655,675 tons of Bessemer steel, 579,083 tons of open-hearth steel, 107,277 tons of steel castings, 9620 tons of crucible steel and 14,452 tons of electric steel. More than half of this output, or 772,340 tons, came from the Rhineland-Westphalia district, with 124,584 tons coming from Alsace-Lorraine. The steel casting and electric steel outputs continue at record proportions with the July production of crucible steel the largest of the war.

### Pig-Iron Exports Make a Record

Pig-iron exports from the United States are now at a greater rate than ever before. For the first six months of 1916 they were 184,471 gross tons, or 24,745 tons per month, and for the fiscal year ended June 30, 1916, they were 286,728 tons or 23,994 tons per month. July exports this year were 28,718 tons. In 1913 the total exports were 277,648 tons, or 23,137 tons per month. These figures contrast with only 18,708 tons per month in 1915 and 9535 tons per month in 1914.

### British Iron and Steel Exports

Advance information regarding British exports of iron and steel and manufactures thereof is that the total for August, 1916, was £5,986,292, which exceeds the value for August, 1915, by £2,452,568 and that for August, 1914, by £3,690,941. Imports of iron ore, scrap iron and steel increased noticeably, the total value being £1,266,585, or an increase of £597,240 over August, 1915.

The Lebanon Valley Iron & Steel Company, Lebanon, Pa., plans to install a new 9 and 12 in. tandem rolling mill. Work has been started on the foundations. Equipment for which orders have been placed includes a 200-hp. Wickes and a 200-hp. Hyde boiler and a 450-hp. Murray engine. Part of the new mill building, which will be 66.5 x 200 ft., will be given over to the manufacture of nuts. When the new addition is completed the company will have 12, 10, 9 and 8 in. finishing mills and a puddling mill.

The Brown Hoisting Machinery Company, Cleveland, has taken an order for 22 locomotive cranes for shipment to the French Government.

## Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast (by rail only), 65c.

**Structural Material.**—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs,  $\frac{1}{4}$  in. thick and over, and zees 3 in. and over, 2.60c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than $\frac{1}{4}$ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

**Plates.**—Tank plates,  $\frac{1}{4}$  in. thick, 6 in. up to 100 in. wide, 3c. to 4c., base, net cash, 30 days, or  $\frac{1}{2}$  of 1 per cent discount in 10 days, carload lots. Extras are:

	Cents per lb.
Tank steel	.Base
Pressing steel (not flange steel for boilers).	.10
Boiler and flange steel plates.	.15
"A. B. M. A." and ordinary firebox steel plates.	.20
Still bottom steel.	.30
Locomotive firebox steel.	.50
Marine steel, special extras and prices on application.	

	Cents per lb.
Rectangular, $\frac{1}{4}$ in. thick, over 6 in. wide to 100 in. wide. Base	.10
Lighter than $\frac{1}{4}$ in., including 3/16 in., up to 72 in. wide.	.20
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 72 in. to 84 in.	.30
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 84 in. to 96 in.	.40
*Lighter than $\frac{1}{4}$ in., including 3/16 in., over 96 in. to 100 in.	.45
*Lighter than 3/16 in., including No. 8, up to 72 in. wide.	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84 in.	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96 in.	.30
*Lighter than No. 8, including No. 10, up to 60 in. wide.	.35
*Lighter than No. 8, including No. 10, over 60 in. to 64 in.	.35
Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered $\frac{1}{4}$ in.	
Over 72 in. must be ordered $\frac{1}{4}$ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.	
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.	
Over 72 in., ordered weight 3/16 in., take No. 8 price.	
Over 72 in., ordered weight No. 8, take No. 10 price.	

	Cents per lb.
Over 100 in. to 110 in. inclusive.	.05
Over 110 in. to 115 in. inclusive.	.10
Over 115 in. to 120 in. inclusive.	.15
Over 120 in. to 125 in. inclusive.	.25
Over 125 in. to 130 in. inclusive.	.50
Over 130 in.	1.00

	Cents per lb.
Universal plates 80 ft. long up to 90 ft. long.	.05
Universal plates 90 ft. long up to 100 ft. long.	.10
Universal plates 100 ft. long up to 110 ft. long.	.20

	Cents per lb.
No charge for rectangular plates to lengths 3 ft. and over.	
Lengths under 3 ft. to 2 ft. inclusive.	.25
Lengths under 2 ft. to 1 ft. inclusive.	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in. (width extra).	.30
Circles over 100 to 110 in. (width extra).	.35
Circles over 110 to 115 in. (width extra).	.40
Circles over 115 to 120 in. (width extra).	.45
Circles over 120 to 125 in. (width extra).	.55
Circles over 125 to 130 in. (width extra).	.80
Circles over 130 in. (width extra).	1.30
Circles under 3 ft., to 2 ft., inclusive.	.55
Circles under 2 ft., to 1 ft., inclusive.	.80
Circles under 1 ft.	1.85
Half circles take circle extras.	
Sketches not over four straight cuts, inc. straight taper.	.10
Sketches having more than four straight cuts.	.20
Plates sheared to a radius take complete circle extras.	

\*Including extra for width.

**Wire Rods.**—Including chain rods, \$55 to \$60.

**Wire Products.**—Prices to jobbers effective Aug. 5: Fence wire, Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.55; galvanized, \$3.25. Galvanized barb wire and staples, \$3.45; painted, \$2.75. Wire nails, \$2.60. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Cement-coated nails, \$2.50. Woven wire fencing, 60 per cent off list for carloads, 59 off for 1000-rod lots, 58 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Nos.	6 to 9	10	11	12	12½	13	14	15	16
Annealed	\$2.60	\$2.65	\$2.70	\$2.75	\$2.85	\$2.95	\$3.05	\$3.15	\$3.15
Galvanized	3.30	3.35	3.40	3.45	3.55	3.65	4.10	4.20	

**Wrought Pipe.**—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on black pipe from Sept. 7, 1916, and on galvanized pipe from July 24, 1916, all full weight:

Steel				Butt Weld				Iron			
Inches	Black	Galv.		Inches	Black	Galv.		Inches	Black	Galv.	
$\frac{1}{4}$ , $\frac{3}{4}$ and $\frac{5}{8}$ . . . .	62	35 $\frac{1}{2}$		$\frac{1}{4}$ and $\frac{1}{4}$ . . . . .	51	24		$\frac{1}{4}$ and $\frac{1}{4}$ . . . . .	51	24	
$\frac{1}{2}$ . . . . .	66	51 $\frac{1}{2}$		$\frac{3}{8}$ . . . . .	52	25		$\frac{3}{8}$ . . . . .	52	25	
$\frac{3}{4}$ . . . . .	69	55 $\frac{1}{2}$		$\frac{1}{2}$ . . . . .	56	38		$\frac{1}{2}$ . . . . .	56	38	
to 3 . . . . .				$\frac{3}{4}$ to 1 $\frac{1}{2}$ . . . . .	59	43		$\frac{3}{4}$ to 1 $\frac{1}{2}$ . . . . .	59	43	

Butt Weld			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	62	55½	51
$\frac{1}{2}$	66	51½	52
$\frac{3}{4}$ to 3	69	55½	56
			59

Lap Weld			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	63	50½	46
$\frac{1}{2}$	66	53½	52
$\frac{3}{4}$ to 3	63	49½	53
13 and 14	63½		55
15	51		55
			54

Reamed and Drifted			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	67	53½	54
$\frac{1}{2}$	61	48½	41
$\frac{3}{4}$ to 3	64	51½	47
			48
			51

Butt Weld, extra strong, plain ends			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	58	40½	51
$\frac{1}{2}$	63	50½	56
$\frac{3}{4}$ to 1½	67	54½	60
2 to 3	68	55½	

Lap Weld, extra strong, plain ends			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	61	49½	48
$\frac{1}{2}$	64	52½	53
$\frac{3}{4}$ to 1½	63	51½	55
2 to 3	59	45½	57
4 to 12	54	40½	56
			50
			45

Butt Weld, double extra strong, plain ends			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	54	43½	43
$\frac{1}{2}$	57	46½	46
$\frac{3}{4}$ to 1½	59	48½	

Lap Weld, double extra strong, plain ends			
Steel	Black	Galv.	Iron
Inches			
$\frac{1}{4}$ , $\frac{1}{2}$ and $\frac{3}{4}$	53	43½	42
$\frac{1}{2}$	55	45½	42
$\frac{3}{4}$ to 1½	54	44½	44
2 to 3	49	35½	43
4 to 12			44
			43

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

**Boiler Tubes.**—Discounts on less than carloads, freight to destination added, effective from Sept. 7, 1916, are as follows:

Lap Welded Steel	Standard Charcoal Iron
$\frac{1}{2}$ in.	1½ in.
1½ and 2 in.	1½ and 2 in.
2½ in.	2½ in.
2½ and 3 in.	2½ and 3 in.
3 and 3½ in.	3 and 3½ in.
3½ and 4 in.	3½ and 4 in.
4 and 4½ in.	4 and 4½ in.
4½ and 5 in.	4½ and 5 in.
5 and 6 in.	5 and 6 in.
6 and 7 in.	6 and 7 in.
7 to 13 in.	7 to 13 in.

Locomotive and steamship special charcoal grades bring higher prices.

1½ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

**Sheets.**—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets	
Nos.	Cents per lb.
3 to 8	2.85 to 2.95
9 and 10	2.90 to 3.00
11 and 12	2.95 to 3.05
13 and 14	3.00 to 3.10
15 and 16	3.10 to 3.20

Box Annealed Sheets, Cold Rolled	
Nos.	Cents per lb.
17 to 21	2.80 to 2.90
22 and 24	2.85 to 2.95
25 and 26	2.90 to 3.00
27	2.95 to 3.05
28	3.00 to 3.10
29	3.05 to 3.15
30	3.25 to 3.35

Galvanized Sheets of Black Sheet Gage	
Nos.	Cents per lb.
10 and 11	3.25
12	3.35
13 and 14	3.35
15 and 16	3.50
17 to 21	3.65
22 and 24	3.80
25 and 26	3.95
27	4.10
28	4.25
29	4.40
30	4.65



## Metal Markets

### The Week's Prices

Cents Per Pound for Early Delivery							
Copper, New York		Tin, New York	Lead, New York		Spelter, New York		St. Louis
Lake	Electrolytic			St. Louis			
Sept. 28.25	28.37½	38.62½	7.00	6.85	9.50	9.25	
20.....	28.25	38.87½	7.00	6.85	9.37½	9.12½	
21.....	28.00	38.50	7.00	6.85	9.25	9.00	
22.....	28.00	.....	7.00	6.85	9.25	9.00	
23.....	28.00	38.62½	7.00	6.85	9.00	8.87½	
24.....	28.00	38.62½	7.00	6.85	9.00	8.75	
25.....	28.00	28.75					
26.....	28.00	28.75					

NEW YORK, Sept. 27, 1916.

Copper is strong and active following the record export transaction. Tin is a little higher but consumers continue conservative. Lead is quiet but steady. Spelter is again inactive and lower. No interest is shown in antimony.

### New York

Copper.—Interest to a very large extent has been centered in the contract for 448,000,000 lb. of copper which was closed late last week between representatives of the entente allies and the principal copper producing companies. A brief account of the purchase appears in another part of this issue. In the opinion of the trade, the best thing about the big sale is that it will assure a steady market for probably a year and thereby enable consumers to buy with easier minds. The transaction will take the allied governments out of the market for at least six months, leaving it strong, but quiet, unless there should be a great increase in domestic industrial demand. With prices where they are, however, it is considered doubtful if purely domestic business will become much heavier, inasmuch as the tendency already is to find substitutes for copper. Domestic consumers have bought freely since they first heard that the closing of the big contract was imminent. Prompt electrolytic was quoted yesterday at 28.75c. to 29c.; October at about 28.50c.; and November and December at about 28c. Sales for the first quarter have been made at 27.25c. to 27.75c. Lake copper is extremely scarce this side of December, for which position it is quoted at 28c. The exports this month, including yesterday, total 21,851 tons. The London market for electrolytic, quoted a week ago at £130 10s., stood yesterday at £138.

Tin.—In a quiet way there has been a little more activity but, while the undertone is good, sellers are disappointed with the failure of consumers to come strongly into the market. Two reasons are advanced to account for the situation, one being that the tin-plate price for next year has not been fixed and that manufacturers do not want to buy pending its adjustment. The other reason is that consumers some time ago accumulated reserve stocks which they are now using. It is believed that when buying does start it will come with a rush and that a runaway market is not improbable. On Sept. 21 about 100 tons was taken, future deliveries being specified for the most part, some of them as far ahead as next June. On the following day probably 300 tons changed hands and the nearby positions again were neglected. From day to day there has been a steady business in Banca at recessions from the price of Straits. The latter, spot delivery, was quoted yesterday at 38.62½c. The arrivals this month total 3750 tons and there is afloat 2960 tons.

Lead.—The market has become much quieter and is steady at 7c., New York, and 6.85c., St. Louis. Domestic consumers bought freely on the rise but seem now content to simply watch the market. For prompt metal independent producers last week asked up to 7.15c., New York, but they are now offering at the 7c. level. A feature of the situation is a heavy demand from Canadian interests which are still in the market. The production and consumption of lead are pretty evenly matched, and it therefore takes but little to change the course of the market. The exports this month, including yesterday, total 4416 tons.

Spelter.—Some interests reported more inquiry yes-

terday than had existed for some days, but the market was nevertheless spotty and prices were a shade lower than on the preceding day. Spot was quoted yesterday at about 9c., New York, and 8.75c., St. Louis, with last quarter at 8.50c. to 8.62½c., St. Louis. Business tapered off early last week. A round sized lot was taken early last week by Canadian consumers. The big purchase of copper by Great Britain and her allies is expected to eventually bring about a good movement in spelter, but it is realized that this may not come for several weeks or even months. The exports are heavy, amounting this month, including yesterday, to 10,591 tons.

Antimony.—The dullness of recent weeks is unbroken, so far as prompt deliveries are concerned. Some sales of near future metal have been made at 9.50c., in bond. Certain producers say they are holding for 13c. in bond, but from dealers spot metal can be obtained around 11c., duty paid.

Aluminum.—No. 1 virgin aluminum, 98 to 99 per cent pure, is quoted at 62c. to 63c. per lb.

Old Metals.—The market is firm. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible.....	26.00 to 27.00
Copper, heavy and wire.....	24.50 to 25.50
Copper, light and bottoms.....	21.50 to 22.50
Brass, heavy.....	14.00 to 15.00
Brass, light.....	11.50 to 12.00
Heavy machine composition.....	20.00 to 20.50
No. 1 yellow rod brass turnings.....	14.75 to 15.50
No. 1 red brass or composition turnings.....	16.00 to 17.00
Lead, heavy.....	6.25
Lead, tea.....	5.75
Zinc.....	7.00 to 7.50

### Chicago

SEPT. 25.—Recent selling of copper has evidenced the same spectacular demand that has been absorbing ferrous metal production. Lead also has been active, but spelter is again quotably lower. We quote: Casting copper, 26.50c. to 27c.; Lake copper, 28.50c. to 29c.; tin, carloads, 39.50c., and small lots, 41c.; lead, 6.90c. to 6.95c.; spelter, 9c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 13c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 22c.; copper bottoms, 20c.; copper clips, 21c.; red brass, 18.50c.; yellow brass, 14c.; lead pipe, 5.50c.; zinc, 6c.; pewter, No. 1, 25c.; tinfoil, 27c.; block tin pipe, 32c.

### St. Louis

SEPT. 25.—Lead has shown the greater activity among the metals, and has moved up somewhat. The closing quotations today were: Lead, 6.95c. to 7c.; spelter, 9c. to 9.25c., according to delivery; tin, 41c.; Lake copper, 29c.; electrolytic copper, 28.75c. to 29c.; antimony, 14.50c. to 15c. In the Joplin ore district lead ore also took an upward shoot and sold up to \$75 per ton, with the average for the district at \$70. Zinc blende sold at \$45 to \$65, with the average for the district \$56. Calamine sold at \$35 to \$45, with the average for the week at \$42. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 9c.; heavy yellow brass, 12c.; heavy red brass and light copper, 17c.; heavy copper and copper wire, 19c.; zinc, 6c.; lead, 5c.; tea lead, 3.50c.; pewter, 25c.; tinfoil, 31c.

At the fire at the plant of the Delaney Forge & Iron Company, Buffalo, N. Y., on Sept. 15, only one of the five buildings was destroyed, with a total loss of not over \$25,000, instead of \$200,000, as previously reported. One motor generator set was the only equipment ruined and only three days' time was lost.

The J. M. Schoonmaker, one of the ore boats belonging to the Shenango Steamship & Transportation Company, recently took to upper Lake ports on one trip 14,473.95 tons of coal, which was the largest cargo of coal ever hauled on any Lake boat in one trip.

On Oct. 6 the city of Alliance, Ohio, will receive bids for one 6,000,000-gal. cross compound pumping engine and one motor-driven triplex booster pump. Bids will be received Oct. 5 for 1000 disc meters, ranging in size from ¾ in. to 1 in.

## Iron and Industrial Stocks

NEW YORK, Sept. 27, 1916.

The stock market has been boiling the past week. Transactions have attained a larger volume daily than for a considerable number of years, and several industrial stocks have made new high records. United States Steel Corporation common sold up to 120 and the preferred to 121½. Republic common reached 72½. Various other stocks made new high records. Profit taking caused recessions the early part of this week, but apparently the break in prices was not due to a collapse of the upward movement. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com..	24½-26¾	Pitts. Steel, pref.100	-103
Allis-Chal., pref..	79-80¾	Pressed Stl., com. 58½	-61¼
Am. Can, com....	63¾-65¾	Pressed Stl., pref.103	-103¾
Am. Can, pref....	112½-113¾	Ry. Steel Spring,	
Am. Car & Fdy.,		com. ....	50-54½
com. ....	65¼-68¾	Ry. Steel Spring,	
Am. Car & Fdy.,		pref. ....	101
pref. ....	117¾	Republic, com....	64¼-72½
Am. Loco., com..	77½-81	Republic, pref....	110½-112
Am. Loco., pref..	105¾-107	Sloss, com. ....	57½-60½
Am. Stl. Fdries..	56½-59½	Sloss, pref. ....	97
Bald. Loco., com.	84½-90½	Pipe, com. ....	22¾-23¼
Bald. Loco., pref.	106	Pipe, pref. ....	53¾-55
Beth. Steel, com.	554-575	U. S. Steel, com..	107-120
Case (J. I.), pref.	84½	U. S. Steel, pref..	120½-122
Colo. Fuel. ....	52¾-59¼	Va. I. C. & Coke	49¾-54½
Deere & Co., pref.	92-93½	Westing. Elec....	63½-65¾
Gen. Electric....	173¾-175½	Am. Rad., com....	397
Gt. No. Ore Cert.	42-45¾	Am. Ship, com....	49-49¾
Int. Harv. of N. J.,		Am. Ship, pref....	94
com. ....	115¾-118	Chic. Pneu. Tool	73-76
Int. Harv. of N. J.,		Cambria Steel... 81¼-82	
pref. ....	120	Lake Sup. Corp..	13¾-14¾
Int. Harv. Corp.,		Warwick. ....	9¾-9¾
com. ....	77½-78	Cruc. Steel, com.	89-95¼
Int. Harv. Corp.,		Cruc. Steel, pref.	119½-121¾
pref. ....	109	La Belle Iron,	
Lacka. Steel....	82¾-86	com. ....	61-67
Nat. En. & Stm.,		Carbon Stl., com.	88-89
com. ....	28¼-31¼	Central Fdy., pref.	28½
Nat. En. & Stm.,		Driggs-Seabury	94½-108
pref. ....	95¼-96	Midvale Steel...	72¾-76¾
N. Y. Air Brake..	140-144		

## Dividends

The Yale & Towne Mfg. Company, regular quarterly, 1¼ per cent and special 5 per cent, both payable Oct. 2.  
Manning, Maxwell & Moore, Inc., regular quarterly, 1½ per cent, payable Sept. 30.  
The Boston Belting Company, regular quarterly, \$2 a share, payable Sept. 30.  
The Eastern Car Company, Halifax, N. S., regular quarterly, 1½ per cent, payable Oct. 14.  
The Nova Scotia Steel & Coal Company, regular quarterly, 2 per cent on the preferred stock, payable Oct. 14. No action was taken on the common stock dividend.  
The Colt's Patent Fire Arms Mfg. Company, regular quarterly, 4 per cent, and extra 2½ per cent, payable Oct. 2.  
The International Harvester Company of New Jersey, regular quarterly, 1¼ per cent on the common stock, payable Oct. 16.  
The Torrington Company, regular quarterly, 75c. per share on the common stock, payable Oct. 1.  
The Willys-Overland Company, regular quarterly, 1¼ per cent on the preferred stock, payable Oct. 2.  
The American Screw Company, regular quarterly, 1¼ per cent, payable Sept. 30.  
The American Seeding Machine Company, regular quarterly, 1 per cent on the common stock and 1½ per cent on the preferred stock, payable Oct. 15.  
The Canadian Crocker-Wheeler Company, regular quarterly, 1¼ per cent on both common and preferred stocks, payable Sept. 30.  
The Canadian Locomotive Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 1.  
The General Railway Signal Company, regular quarterly, 1½ per cent on both common and preferred stocks, payable Sept. 30.  
The Hupp Motor Car Corporation, regular quarterly, 1¼ per cent on the preferred stock, payable Oct. 2.  
The Otis Elevator Company, regular quarterly, 1¼ per cent on the common stock and 1½ per cent on the preferred stock, payable Oct. 16.  
The Saxon Motor Car Corporation, regular quarterly, 1¼ per cent, payable Oct. 2.  
The Youngstown Sheet & Tube Company, regular quarterly, 2 per cent on the common stock and 1¼ per cent on the preferred stock, payable Oct. 1.  
The E. W. Bliss Company, regular quarterly, 1¼ per cent on the common stock and extra of 100 per cent, payable Oct. 2. An extra of 100 per cent was paid July 1 of this year.

The Lebanon Chain & Iron Company, Lebanon, Pa., is taking bids on a new building, 60 x 120 ft., of steel construction, as an addition to its plant. This will double the present capacity. Edgar A. Weimer is president and Frank E. Krause is manager.

## Judicial Decisions

ABSTRACTED BY A. L. H. STREET

**PRIORITY OF MORTGAGES ON MACHINERY.**—One who lent money to be used by the borrower in purchasing additional machinery to be installed in an industrial plant, under a mortgage covering the plant and "all machinery that may hereafter be added to said premises," has a lien on newly acquired machinery superior to that of the selling manufacturer under a chattel mortgage given back by the owner of the plant to cover the purchase price of such new machinery; the first-mentioned mortgagee having recorded his mortgage several weeks before the manufacturing company recorded its lien. A mortgage may validly provide that it shall cover property to be acquired by the mortgagor in the future. (Arkansas Supreme Court, Murray Company vs. Satterfield, 187 Southwestern Reporter, 927.)

**INJURY CAUSED BY CLOGGED MACHINE.**—An operator of a punching machine is not to be prevented from recovering for injury due to negligent starting of the machine by his superior employee while he was unclogging it, because he had been instructed to call the machinist when necessary; it appearing that the services of the machinist were not reasonably necessary in this instance. (New York Supreme Court, Appellate Division, Cocchia vs. Rapid Addressing Machine Company, 160 New York Supplement, 474.)

**WITHDRAWAL OF OFFER OF SALE.**—An offer to sell goods on condition that an acceptance of the offer be accompanied by certified check was subject to withdrawal any time before the check was mailed. (New York Supreme Court, Appellate Division, Hayman vs. Canton Art Metal Company, 160 New York Supplement, 42.)

**PAYMENT OF ACCOUNTS.**—Receipt of a payment in full discharge of an unliquidated or disputed claim will bar any further demand on the same indebtedness. But when a debt is definitely ascertained as to amount, the receipt of part, although acknowledged as full satisfaction, does not discharge the debtor's liability for the balance actually remaining due, unless the release be given on some new consideration. (Oklahoma Supreme Court, Sherman vs. Pacific Coast Pipe Company, 159 Pacific Reporter, 333.)

**BUYER'S WAIVER OF RIGHTS CONCERNING MISREPRESENTATIONS.**—When a contract for sale of machinery is modified under the buyer's claim that the original contract was induced by misrepresentations made to him, he thereby waives any right of action on account of any such misrepresentations. And a buyer's inexcusable delay for a year in attempting to rescind a purchase on the ground of fraud bars a rescission at his instance. (California Supreme Court, Brown vs. Domestic Utilities Mfg. Company, 159 Pacific Reporter, 163.)

**WAIVER OF DEFECTIVE CONDITION OF WIRE.**—Where a quantity of wire was sold without any representation on the part of the seller as to its condition, the buyer's acceptance and use of it after inspecting it will waive any right to claim damages afterward on account of any obviously defective condition. (Oklahoma Supreme Court, Talley vs. Harrison, 159 Pacific Reporter, 366.)

## Book Review

**Poor's Manual of Industrials for 1916.** Pages, 3112; 5¼ x 8¼ in. Published by Poor's Manual Company, New York. Price, \$10.

With 3112 pages of text, the manual for 1916 is nearly 10 per cent larger than the previous one. It contains the latest income accounts and balance sheets of industrial companies. These tables are in most cases presented in comparative form, showing at a glance the growth of the business. The general information in the book is revised to Aug. 15. There is also an appendix giving recent information on the steam railroads and the public utilities. Since nearly all manufacturing companies have had a phenomenal volume of business in the past year and profits have broken all records, Poor's Manual of Industrials is of particular value at this time. Its exhibits, while in prosaic setting, represent a veritable romance in American industrial development.



STRIKES AND SETTLEMENTS

Some New England Troubles Subsiding

Conferences are in progress which it is believed will settle the trouble at the Pittsfield, Mass., plant of the General Electric Company. Members of the State board of conciliation and arbitration are conducting the negotiations and are hopeful of bringing about an agreement. It has been stated by the union leaders that unless a settlement is effected by Thursday, Sept. 28, the employees of the Schenectady plant of the company will go out in sympathy.

The strike in Greenfield, Mass., among the tool-makers is a thing of the past, as the men have voted unanimously to return to work.

The trouble among the foundries in Bridgeport, Conn., has taken a new turn. Suits aggregating \$200,000 have been brought against the Monumental Bronze Company, E. N. Sperry, its president; John Thompson, the latter's chauffeur; Richard F. Claney, superintendent, and Charles Robinson, a foreman. There are three complainants who in two cases assert that the defendants instigated attacks upon them which resulted in personal and property injuries, and all three claim that they were fraudulently arrested and tried on the charge of breach of the peace. In these trials the complainants were acquitted. Real estate and money belonging to the defendants have been attached. There are now suits pending against some of the strikers, and it is probable that the series of suits will go to the Supreme Court. Conspiracy is charged against both parties to the controversy.

Milwaukee Machinists' Strike About Ended

Milwaukee employers have won in the strike trouble with the machinists' unions, which culminated in walk-outs on July 18 to enforce the demand for an 8-hr. day without reduction in pay. All last week a throng of striking machinists went back to work, and with the decision on Sunday, Sept. 24, of the strikers from the Allis-Chalmers shops to return, the trouble is practically at an end. The Milwaukee Metal Trades and Founders' Association is considered an unequivocal victor, not having been obliged to make any concessions or to accede to any demand of the unions, or to offer any inducements for the men to return to work. In fact, the employers were placed in the position of selecting the men they wanted from those of the strikers who applied for their former positions.

Female Labor in French Munition Plants

No more men are to be employed in French munition plants where the work can be equally well done by women, according to an order by the French Minister of Munitions. A list of operations which can be as well performed by women includes, in the manufacture of steel, shells between 75 and 120 mm.; the preliminary examination of the bars and materials, including manipulation of the testing laboratory; all cutting-off operations excepting the setting of the machine tools and the hardening and tempering of the shell, including subsequent verifications and the measurement of temperatures. In the machining stages half the operations are to be performed by women who will make the subsequent examinations preparatory to the fixing of the copper bands in the hydraulic press, which they will also undertake, together with the turning and gaging. In the production of gages the manufacture of the head will be done by men, but all the other operations, greasing and casing, will be done by women, who will also perform certain work connected with the manufacture of the body. In making plugs for the gage relays certain manipulations on the big power presses are to be reserved for men, but all the work at the drills, lathes and grinders is to be done by women, who will also gage the finished parts. In the manufacture of the case of the 75 mm. shell practically every operation up to the final painting and varnishing is scheduled as woman's work. About half the work on the priming tubes of the 75's will remain in the hands of men, and the same applies to the manufacture of

brass fuses up to the machine stages, but the screwing, finishing and final gaging are to be done by female labor.

Record-Breaking Tin-Plate Exports

Tin-plate exports from the United States now exceed anything ever recorded. For the first six months of 1916 the total was 122,839 gross tons or at the rate of 20,473 tons per month. The increase since January has been progressive, starting with 12,177 tons and increasing to 29,750 tons for the month of June. The largest previous exports before the war were 4817 tons per month in 1913. The following table from Government data gives the comparison of exports in gross tons:

	Total	Tons Per Month
First half of 1916	122,839	20,473
Fiscal year ended June 30, 1916	230,472	19,206
Fiscal year ended June 30, 1915	80,009	6,667
Fiscal year ended June 30, 1914	47,376	3,939

It will thus be seen that the average for the first half of 1916 exceeds the previous war record of 19,206 tons for the last fiscal year. The July exports were 18,742 tons.

As indicating the breadth of the distribution of export tin plate, the table below gives the Government data showing the destination of most of the exports for the fiscal years ended June 30, 1914 and 1916, in gross tons:

	1914	1916
Great Britain	None	29,783
Canada	3,310	52,394
Argentina	1,282	18,717
Brazil	805	11,848
China	4,012	15,807
British India	9	20,334
Japan	191	24,647
Other countries	3,685	33,250

The great increase in exports to Great Britain and Canada is noteworthy, as well as to China and Japan.

Tin-plate exports for Great Britain for the first six months of 1916 were 198,335 gross tons or 33,056 tons per month. In 1914 they were 435,392 tons or 36,282 tons per month.

New Rennerfelt Electric Furnaces

Four more Rennerfelt electric steel furnaces for installation in the United States have been sold by Hamilton & Hansell, 17 Battery Place, New York, as follows:

- Ducas & Co., New York, a 3-ton furnace, 600 kw., for making steel castings and ingots.
- Maynard Steel Casting Company, Milwaukee, Wis., a ¼-ton furnace, 300 kw., for making steel castings.
- The Acleral Company of America, Newark, N. J., a 300-lb. furnace, 50 kw., for making special alloys.
- J. Leslie Rodgers, Philadelphia, a ¼-ton furnace, 200 kw., for making tool steel. This company will also install 10 small furnaces of special size for making ferrotungsten.

Besides these American installations, six Rennerfelt furnaces have been sold abroad in the last few weeks, all to be used for making steel. The total number of Rennerfelt furnaces installed or contracted for is now 76, of which 18 are in the United States, not including the 10 small ones, mentioned above, for making ferrotungsten.

Central Station Power for Steel Mills

Central station power for steel mills was discussed at the recent annual meeting of the Association of Iron and Steel Electrical Engineers at Chicago. The larger mills, it was asserted, can produce power as cheaply and as reliably as central stations, but with the smaller mills, where the process begins with billets and is carried through to a finished product, central station power is in favor. One suggestion was that central stations might very well purchase the surplus gas of the steel plant for fuel purposes and the steel mill in turn purchase the electrical energy. The point is that in plants where fuel gas is available the peak supply does not always coincide with the peak power demand. It was also contended that the utilization of waste heat involves so much money in the matter of first cost of the power installation that the unit cost of the power is very nearly as great as power generated from a coal-burning plant.

## Pittsburgh and Nearby Districts

The Wheeling Mold & Foundry Company, Wheeling, W. Va., was incorrectly reported in THE IRON AGE of Sept. 21, page 652, as having closed its plant on account of labor troubles. The company states that only a portion of the men in one of its departments stopped work for two days last week while certain details as to shop practice were discussed. An agreement which was satisfactory to both the employees and the management was reached and the interruption was so slight as to be hardly remarked. The company further states that the entire plant is working to its utmost capacity without any element to retard its production.

The Allegheny Steel Company, Pittsburgh, which has an open-hearth steel plant and sheet and plate mills at Brackenridge, Pa., is adding another 100-ton open-hearth furnace, which will be ready about Dec. 1, and is also adding more soaking pits. The present plant has six basic open-hearth furnaces and two 4-hole soaking pits. Several years ago the company bought a 36-in. blooming mill of the Mackintosh-Hemphill type that was built for another concern, and stored it at Brackenridge. It is now being prepared for use and will be ready for operation about Dec. 1. This mill will greatly increase the output of sheet bars, which will relieve the company, as it has been a buyer of sheet bars in the open market to a considerable extent. With the new open-hearth furnace finished, the plant will have a monthly output of 20,000 tons or more of steel ingots.

The net profits of the Pittsburgh Steel Company, Pittsburgh, operating blast furnaces, steel plant, rod, wire and wire nail mills at Monessen, Pa., and hoop and band mills at Glassport, Pa., for the year ended June 30, were \$4,564,067, which is stated to be equivalent to 54.7 per cent on the \$7,000,000 common stock after allowing the full 7 per cent on the \$10,500,000 preferred stock.

The Pannier Bros. Stamp Company, manufacturer of steel stamps and dies, Pittsburgh, has completed plans for the erection of a four-story building, 24 x 100 ft., at Sandusky and Cajou streets, North Side, Pittsburgh. It will occupy the entire building.

In furtherance of its safety-first campaign, the H. C. Frick Coke Company, Pittsburgh, is giving moving pictures at different points throughout the Connellsville coke region. These reproduce in a realistic way various accidents occurring in and about the mines within the past year or two, with demonstrations as to the manner by which the accidents might have been avoided. The pictures were prepared specially for the company. C. L. Albright, manager of the safety-first work of the company, is in charge of the demonstrations.

Stockholders of the Mahoning Valley Steel Company, organized some months ago to erect a sheet-mill plant at Niles, Ohio, have organized by electing Jacob D. Waddell, president; Thomas E. Thomas, vice-president and treasurer, and W. Aubrey Thomas, secretary. The company some time ago bought the sheet mills and other equipment of the Atlanta Sheet & Tin Plate Company at Atlanta, Ind., removed them to Niles, and expects to have the plant in operation before the close of this year.

It is stated that about 50 per cent of the larger nut and bolt manufacturers have notified A. H. Chamberlain, secretary of the American Iron, Steel and Heavy Hardware Association, New York City, that they will continue to allow a 2 per cent discount for bills paid within 10 days after presentment. Some makers of nuts and bolts had proposed to reduce the discount from 2 per cent to 1 per cent.

The American Pattern Mfg. Company, Youngstown, Ohio, recently turned out what is said to be the largest pattern ever made in that district. It is for a pinion housing for a large bar mill being built by the William Tod Company for the Imperial Steel Company of Kobe, Japan. The pattern, when assembled, stood 12 ft. high, 16 ft. wide and 18 ft. long. The diameter of the pinion is 6 ft. 2 in., while the face is 5 ft. 3 in. wide. It took 8000 ft. of lumber.

The Standard Underground Cable Company has purchased property adjacent to its works at Seventh and

Pike streets, Pittsburgh, on which it proposes to build an extension.

Contracts are soon to be awarded for the erection of a large addition to the School of Applied Science of the Carnegie Institute of Technology at Pittsburgh, to cost about \$300,000. Edward Stotz, Monongahela Bank Building, is preparing the plans.

The Sterling Machine & Stamping Company expects to complete its new foundry at Wellington, Ohio, in October, and is now booking orders for light gray-iron castings. The main foundry building is of concrete construction, 80 x 120 ft. It will have a capacity of six to eight tons of finished castings daily. The company also has an aluminum foundry, which is making kitchen ware and other castings.

Reports are untrue that the Follansbee Brothers Company, Pittsburgh, operating an open-hearth steel plant and sheet and tin plate mills at Follansbee, W. Va., had decided to erect an additional plant at that place to cost \$1,500,000. It has merely been considering the erection of another sheet-mill plant, but has done nothing definite.

The Keystone Seamless Tube Company, Pittsburgh, with a capital stock of \$20,000, has been incorporated by A. M. Thompson, Gibsonia, Pa.; H. Stewart Dunn, 4111 Alliquippa Street, Pittsburgh, and Roy Rose, Sewickley, Pa.

The Bailey Reflector Company, Pittsburgh, with a capital stock of \$30,000, has been incorporated by J. Chalmers Stehley; O. R. Degelman, 617 Second Avenue, Pittsburgh, and J. E. McCalmonte, to manufacture sheet metals, lighting fixtures, etc.

The Vesuvius Crucible Company, Swissvale, Pa., with a capital stock of \$5,000, has been incorporated by James R. Dunn, 801 Aiken Avenue, Pittsburgh; James R. Miller, Glen Osborn, Pa., and John Heron, Pittsburgh, to manufacture articles of graphite and other refractory materials.

The Acme Stove & Range Company, Carnegie, Pa., with a capital stock of \$150,000, has been incorporated by William Ralph Jones, Andrew C. Weisberg, Thomas A. Havican, William A. Kleeb and H. Fred Mercer, Pittsburgh, to manufacture stoves, ranges and stove accessories.

The Amend Coal Company, Greensburg, Pa., with a capital stock of \$100,000, has been organized by J. S. Amend, J. R. Eisaman, C. E. Cowan and Paul Johnson, of Greensburg, and R. W. Playford, Uniontown, to mine coal and to manufacture coke and by-products.

The Baldwin Cutlery Company, Tidioute, Pa., with a capital stock of \$15,000, has been incorporated by Henry D. Baldwin, H. S. Keck and Ellis S. Kennedy to manufacture tools.

The Standard Screw Company, Corry, Pa., with a capital stock of \$25,000, has been incorporated by S. V. Stewart, F. N. Ames, L. R. Bliss, C. F. Bliss and L. T. McElroy.

## Guards Employees' Health and Insures Them.

The Tuthill Spring Company, Chicago, has inaugurated a plan for supplying its employees with medical attendance free of charge and with insurance. It has employed a physician by the year. Employees of five years' standing are insured for \$1,000; four years, \$900; three years, \$800; two years, \$700; one year, \$600, and six months, \$500. A man is not insured until he has been with the company six months, but at the end of that time he is automatically placed on the list of insured. Aside from reasons of philanthropy it is hoped that the plan will lead men to stay longer with the company, endeavoring to keep their positions by faithful service.

Considerable tungsten is coming from Peru. Prior to 1910 none was exported from that country, but in that year 12 tons was shipped. At present about 345 tons per year are exported, mostly to the United States and England. Peru's production of copper bars in 1915 was 30,204 gross tons, against 23,134 and 20,039 tons in 1914 and 1913.



# Machinery Markets and News of the Works

## LABOR SUPPLY SHORT

### Some Cities Lack Housing Facilities

#### Business Brisk, Though Consisting Mainly of Single-Tool Buying—Pacific Coast Is Prosperous

The shortage of labor threatens to reach an acute stage in some cities. In New Jersey and other Eastern States there not only is an insufficient supply of mechanics, but housing those available is a problem. The worst situation in this respect probably exists in Detroit, where men have been drifting away because of the high rentals they are asked to pay. Skilled men are almost impossible to obtain in that city and production has been curtailed. The labor situation has been relieved somewhat in Milwaukee by the return to work of machinists who walked out July 25, but many more men could be used.

Business is generally brisk, although the absence of round-lot buying is notable. Industrial concerns throughout the country are actually placing orders for one or a few machines, despite the extended time they must wait for the delivery of standard machines.

The automobile truck builders in Cincinnati and elsewhere are working to capacity. The machine tool trade in that city notes a betterment in the domestic demand.

In Cleveland the labor situation in the jobbing foundries shows some improvement. Strike troubles and the shortage of molders have been a great influence in delaying deliveries with those tool builders who do not operate their own foundries.

Good reports come from San Francisco and the Pacific Northwest, where the shipbuilding industry is booming as never before.

Canada is being educated to manufacture products formerly made in Germany. The Department of Trade and Commerce of the Dominion is exhibiting about 8000 samples of goods made in German and Austrian shops and factories. The exhibit was gathered in various parts of the world by the British Board of Trade, and will be shown for two weeks in Montreal and two in Toronto.

## New York

NEW YORK, Sept. 27, 1916.

From all directions come reports of a good scattered demand from industrial companies who want from one to three or four machines for the nearest shipment possible. In some cases they have bought second-hand equipment for the reason that it can be shipped immediately from warehouse floors. A dealer who bought seventeen used automatic screw machines re-shipped them without delay to a purchaser.

Not only is present business of a good normal sort, but there is promise of increased activity when the labor situation becomes easier. In parts of New Jersey, Pennsylvania, Maryland and Delaware there is such a dearth of mechanics that several shops are only working 60 to 70 per cent, although they have enough orders in hand to justify operation

at full capacity. The housing problem also is a serious one in some localities. In Elizabeth, N. J., where the Samuel L. Moore & Sons Corporation is making large additions to its plant preliminary to the building of small ships and submarines, there are not enough houses, and the high cost of building materials halts the construction of small homes. The Samuel L. Moore & Sons Corporation has erected several new buildings and has just obtained a city permit to run a railroad siding into the shipbuilding plant.

Manufacturers of brass goods are exceedingly busy, and have been active purchasers of hand screw machines. The backwardness of deliveries is evidenced by the fact that machines are being shipped for which the contracts were signed last year, this being the case with a lot of tools for the Jersey City Technical High School. Other machines which were ordered a year ago are just going abroad. Deliveries by tool builders who do not operate their own foundries have been greatly hampered by strike troubles in jobbing foundries, and by the lack of molders where there is no labor trouble.

The Roumanian Purchasing Commission, Hotel Biltmore, New York, was recently in the market for about thirty hand screw machines.

Dealers who have made sales of tools for shipment to Holland say that their forwarding agents are encountering no trouble despite the statement cabled from London a week ago that London would restrict shipments to the Netherlands Oversea Trust. In the week such shipments have been made.

The Joseph Dixon Crucible Company, Jersey City, N. J., has purchased the plant of the Pacific Borax Company on West Side Avenue, Jersey City, comprising about 18 acres with buildings, along the line of the Central Railroad of New Jersey, and will use the property to enlarge its manufacturing facilities.

The Seeley Electric Company, Spencer, N. Y., has increased its capital stock from \$15,000 to \$30,000.

The Rochester Folding Box Company, 10 Commercial Street, Rochester, N. Y., on account of increasing business, has constructed a new factory on Elizabeth Avenue, Greece, N. Y., 200 x 225 ft., with separate power plants, on a site covering 12 acres.

The Condor Aero Company, Buffalo, recently incorporated with a capital stock of \$5,000,000, has purchased a site of 28 acres on Walck Road, North Tonawanda, N. Y., on which it will build, from plans now being prepared, a plant for the manufacture of aeroplanes designed by Max Near and Valentine Buettner, respectively vice-president and secretary of the company. William J. Hines is president.

The Linde Air Products Company, Forty-second Street Building, New York, has awarded contracts for a group of factory buildings to be erected at Stinson Boulevard and East Hennepin Avenue, Minneapolis, Minn., and for two factory buildings, one and two stories, at 155 Chandler Street, Buffalo, N. Y. W. F. Barrett is works manager.

The Mohawk Veneer Company, Salisbury Center, N. Y., has been incorporated with a capital stock of \$50,000 to manufacture veneer, etc. The incorporators are T. McCabe, Salamanca, N. Y.; E. R. Morrison, Jamestown, N. Y., and R. Z. Morrison, Warren, Pa.

The Troy Engine & Machine Company, Troy, N. Y., has plans in preparation for a foundry building, one and two stories, which it will erect at an approximate cost of \$50,000. John Parsons is president.

The Eclipse Machine Company, Elmira, N. Y., Edw. J. Dunn, president, is taking bids for the erection of a machine shop and tool room addition, 40 x 72 ft., and 40 x 100 ft., respectively, two stories.

The Clay Cutlery Company, Andover, N. Y., is taking bids for a factory, 50 x 100 ft., one story, to cost approximately \$10,000.

Incorporation papers have been issued to the E. V. Stratton Motors Company, Albany, to manufacture motors, trucks, etc. E. V. Stratton, G. D. Hills and J. S. Pettit, 81 Chapel Street, Albany, are incorporators. The capital stock is \$51,000.

The American LaFrance Fire Engine Company, Elmira, N. Y., has let contract for the erection of a machine shop and toolhouse addition, 40 x 100 ft. James R. Clarke is president and general manager.

The Schaffer Loom Company, Buffalo, N. Y., capitalized at

\$100,000, has been incorporated to manufacture devices for weaving fabrics, carpets, etc. W. A. Schaffer, Detroit, Mich., and E. H. Patterson, 31 Woodward Avenue, Buffalo, are the directors.

The Catchpole Boiler, Foundry & Machine Works, 23 Jackson Street, Geneva, N. Y., has let contract for the erection of a core building, 50 x 60 ft. Walter Howard is manager.

The Eastman Kodak Company, Rochester, N. Y., has awarded contract for a factory addition, 65 x 125 ft., four stories and basement. J. A. Robertson is manager.

The board of managers of the New York State Training School for Girls, Hudson, N. Y., Annie Windsor Allen, president, is receiving sealed proposals for a heating plant, stokers for boilers, etc.

The National Carbon Company, Cleveland, Ohio, has completed plans for a factory addition, 135 x 300 ft., one story, to its plant at Niagara Falls, N. Y., to cost about \$50,000. James Parmalee, West 117th Street and Madison Avenue, Cleveland, Ohio, is president.

M. L. Oberderfer, 804 East Water Street, Syracuse, N. Y., has had plans completed for a core building, 50 x 101 ft., one story and basement, which he will erect at once.

The Titanium Alloy Mfg. Company, Niagara Falls, N. Y., is ready for bids on a boiler house, 46 x 53 ft., one and two stories.

The Hamburg Planing Mill Company, Hamburg, N. Y., is having plans prepared for a two-story mill, 50 x 100 ft., to cost \$20,000.

The Buffalo Copper & Brass Rolling Mill, Military Road, Denver Street and New York Central Railroad, Buffalo, F. M. Mills, superintendent, is rebuilding its factory, 100 x 300 ft., one story.

The New York Central Realty & Terminal Company, a holding company of the New York Central Railroad, has purchased the block bounded by Perry, Chicago and Scott streets and the New York Central tracks, in the wholesale produce district of Buffalo, and containing about 3½ acres, on which it will erect a cold storage warehouse.

The Duratex Company, 768 Frelinghuysen Avenue, Newark, manufacturer of leather goods, will build a one and two-story addition, at a cost of about \$15,000.

The White Tar Company, Cliff and John streets, New York, will build a refining plant on the Hackensack River, Kearny district, to cost about \$30,000.

The Positive Lock Washer Company, Vanderpool Street and Avenue A, Newark, manufacturer of steel lock washers, has had plans prepared for a two-story addition, 60 x 74 ft., to cost about \$10,000.

The board of education, Newark, N. J., is taking bids for machine tools and other equipment for its manual training department. R. D. Argue is secretary.

The Central Dyestuff & Chemical Company, Newark, manufacturer of aniline dyes, has filed plans for additions to its plant on Plum Point Lane to be used as a pipe shop, carpenter shop and laboratory.

The Newark Tube & Metal Works, 560 Ferry Street, Newark, specializing in the manufacture of steel tubing, will make alterations and extensions in its plant.

Directors of the German Hospital, 340 Bank Street, Newark, have filed plans for the erection of a mechanical laundry plant and power station, about 40 x 60 ft., to cost \$34,450.

The Universal Electric Company, Oliver and Mulberry streets, Kearny, N. J., has been incorporated with a capital of \$25,000 to manufacture electrical machinery. Carl T. and Gustave O. Westlin and Frank Koch, Arlington, N. J., are the directors.

The New York Central Railroad has awarded a contract to the Webster Mfg. Company, Chicago, for the installation of ship shovels and conveying machinery at its No. 7 grain elevator, West New York, at a cost of \$18,500.

Steel & Skirm, Trenton, have awarded a contract for the erection of an automobile garage and machine shop on Montgomery Street, at a cost of about \$15,000.

Rice & Adams, Buffalo, manufacturers of dairy machinery, are taking bids on a three-story concrete addition to its plant, 60 x 175 ft., at Chandler Street and the New York Central Railroad Belt Line. The estimated cost is \$75,000.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., has leased from the Crystal Spring Water Company the four-story building at Tenth Avenue and Thirty-sixth Street, New York, at an aggregate rental of about \$150,000. It is reported the building will be used as a service station and factory.

## New England

BOSTON, MASS., Sept. 26, 1916.

Control of the Howe Scale Company, Rutland, Vt., has been secured by capitalists whose names have not been divulged. It is reported that the new owners are closely allied with the Du Pont interests. Ex-Governor John A. Mead will continue as president, Carl B. Hinsman will be vice-president, Edward V. Ross treasurer, and L. G. Bagley general agent. Present plans for enlarging the plant will be carried out.

The Standard Tire Valve Company, Boston, Mass., has been incorporated with capital stock of \$100,000. The directors are John W. McCormack, president; Michael F. Clarke, 40 Central Street, treasurer, and J. F. Luther.

The North & Judd Mfg. Company, New Britain, Conn., will build an addition, 57 x 87 ft.

The Hold-No-Pone Company, Boston, Mass., has been incorporated with capital stock of \$50,000 to manufacture mechanical instruments. The directors are F. M. Lambert, president; Ellen M. Martin, 600 Massachusetts Avenue, Cambridge, treasurer; and J. O'Brien.

The H. E. Harris Engineering Company, Bridgeport, Conn., has increased its capital stock from \$50,000 to \$100,000.

The Bridgeport Brass Company, Bridgeport, Conn., has secured a permit to build a casting shop, 40 x 60 ft., one story, on Pembroke Street.

The Clark Brothers Bolt Company, Milldale, Conn., has issued 1000 additional shares of stock, bringing its capital stock to \$250,000.

The Bristol Brass Company, Bristol, Conn., has announced that it will build 20 more houses for employees in addition to the 35 now being erected.

The B. & K. Company, New Britain, Conn., has had plans drawn for an addition, 60 x 200 ft., one story, to be used as a forge and galvanizing shop.

The General Electric Company, Windsor, Conn., has awarded a contract for an addition, 30 x 30 ft., three stories.

It is reported that the Chase Rolling Mill Company and the Chase Metal Works, Waterbury, Conn., will erect, on Grand Street, opposite the City Hall, a building to be used as executive offices. It is understood that the building will be a large and imposing structure.

## Philadelphia

PHILADELPHIA, PA., Sept. 25, 1915.

Henry Disston & Sons, Inc., Tacony, Philadelphia, have awarded contract to the Austin Company, 53 Transportation Building, Philadelphia, for the erection of a one-story concrete and steel machine shop, 73 x 150 ft., at Unruh Street, east of State Road, at an estimated cost of \$29,000.

The Edward G. Budd Mfg. Company, Twenty-fifth Street and Hunting Park Avenue, Philadelphia, manufacturer of steel automobile bodies, etc., has awarded contract to Joseph S. Miller & Co., for electrical equipment for its recent plant additions, at an estimated cost of \$20,000.

The Lancaster Steel Products Company, Lancaster, Pa., has started the erection of another addition to its plant in North Lancaster, and will push it through quickly to completion.

The L. & H. Clutch Company, Philadelphia, has been incorporated with a capital stock of \$25,000, by David Lake, Norristown; Samuel L. Hunter, 149 North Twenty-first Street and Walter W. Hess, 4914 Cedar Avenue, Philadelphia, to manufacture clutches and power transmissions. Milton W. Heiberger, 3807 Chestnut Street, is treasurer.

The American Insulator Company, New Freedom, Pa., has been incorporated with a capital stock of \$150,000 by H. C. Hendrix, H. C. Kugler, Maurice Spector, Ira S. Painter, S. C. Bowers, C. N. Neunamaker and Emill Hemming, all of New Freedom; William Ottemiller, G. C. Krone and C. F. Obermaier, York, to manufacture electric insulating materials, etc.

The Anderson Mfg. Company, Philadelphia, has been formed, with a capital stock of \$10,000 to manufacture heat-regulating devices and other patented devices. Walter M. Fowler, Sixty-fifth Avenue and Thirteenth Street; James S. Fellows, 3203 Summer Street, and J. Scott Fowler, 39 Laurel Street, Philadelphia, are the incorporators.

Duff C. Law, Inc., Philadelphia, has been incorporated with a capital stock of \$20,000, by Duff C. Law, Arthur H. Butler and William H. Thomas, to manufacture motion picture machines and supplies. W. S. Furst, 6375 Lancaster Avenue, Philadelphia, is treasurer.

The West Virginia & Pennsylvania Coal Company, 21 South Twelfth Street, Philadelphia, has been incorporated with a capital stock of \$50,000 by Ernest Leigh Clark, 2015



Venango Street, and Dudley Miller, 295 Clairmont Avenue, Philadelphia, and Ernest L. English, Bala, Pa., to mine coal and to manufacture coke and by-products.

Harry Davis and Jefferson Hargest will erect a one-story brick garage and automobile repair shop, 60 x 63 ft., at 302-04-06 Muench Street, Harrisburg, Pa., at a cost of about \$8,000.

The Reading Toy Mfg. Company, Reading, Pa., has been incorporated with a capital stock of \$12,000 by J. Guy Brington, Wyomissing, Pa.; W. Storm Miller and J. Earl Hickman of Reading, Pa., to manufacture toys and novelties.

The Benzol Products Company, Marcus Hook, Pa., has awarded contracts to F. W. Van Loon for the erection of a two-story brick and steel factory building, to cost \$35,000.

## Baltimore

BALTIMORE, MD., Sept. 25, 1916.

The Jones & McComas Box Company, 1818 Lancaster Street, Baltimore, has been incorporated with \$25,000 capital stock by Hugh H. Jones, Jr., Dennison Street near Edmondson Avenue; Walter P. McComas and William H. Hudgins.

With \$45,000 capital stock, the Standard Welding & Cutting Company, Baltimore, has been incorporated to engage in welding and cutting metals. The incorporators are Benjamin H. Cram, president of the Cram Engineering Company, 501 Maryland Casualty Tower Building, Evan Rinehardt and Leander Dorsey.

The Pyrites Company, Ltd., South Wilmington, Del., will construct a four-story chloriding building, 73 x 94 ft., of steel and concrete construction to cost \$20,000; a precipitating tank, and two storage bins. The total cost will be about \$30,000.

With \$20,000 capital stock the Vesuvius Manganese Company, Vesuvius, Va., has been incorporated. Edward C. Martz, Harrisonburg, Va., is secretary.

The Peach Bottom Slate Corporation, Cardiff, Md., has been organized and plans are being made to enlarge its present plant. Carl R. Gray, president of the Western Maryland Railway Company, Baltimore, is president.

A tank shop will be built at Seventh and Hospital streets, Richmond, Va., by the American Locomotive Company.

With \$25,000 capital stock the Pulaski Foundry & Mfg. Company, Pulaski, Va., has been incorporated. O. C. Brewer is secretary.

The Board of Awards, City Hall, Baltimore, will receive bids until Oct. 4 for installing refrigerating machinery in Broadway Market.

The Speakman Supply & Pipe Company, Wilmington, Del., will build a new addition which will cost about \$18,000.

A 150-ton crane has been installed at the plant of the Harlan & Hollingsworth Corporation, Wilmington, Del., by the McMyler Interstate Company, Cleveland, Ohio.

## Chicago

CHICAGO, ILL., Sept. 26, 1916.

In the standard lines of tools, recent sales have included a considerable number of lathes, largely for domestic shops. Makers of ammunition appear still to be in need of equipment. There is also inquiry from Canadian sources for a variety of machines. In the export trade, some of the local dealers have done an especially satisfactory business in fabricating tools for shipyard work. The selling of new tools of standard pattern is largely possible by reason of deliveries now being made against old orders, but the availability of standard tools in general is still so limited as to make the disposition of second-hand machinery decidedly active. Inquiry from the railroads is scattering, and the only group of tools for which prices are being asked is a lot of wood-working machinery for the International & Great Northern Railroad. The Illinois Central, which issued some months ago a tentative list, is expected shortly to purchase some of the tools quoted upon at that time.

The Chicago Coated Board Company, Chicago, will erect a one-story brick factory at 432 East North Water Street, to cost \$10,000. Davidson & Weiss are the architects.

J. F. Cansfield will erect a one-story brick foundry at 1725 Walnut Street, Chicago, at a cost of \$8,700.

Lawder Brothers, Chicago, will build a three-story service station, 79 x 163 ft., at 6918-22 Lafayette Avenue, to cost \$60,000. William Gauger, 36 West Randolph Street, is the architect.

Frank McNellis, 512 South Racine Avenue, Chicago, will build a one-story factory, 50 x 125 ft., to cost \$8,000.

The Illinois Watch Company, Springfield, Ill., will erect a two-story addition to its factory, to cost \$8,000.

The Rock Island Mfg. Company, Rock Island, Ill., has taken out a permit for an addition to its foundry to cost \$3,000.

The Northern Pacific Railroad has announced plans for the erection of a plant at West Allis, Wis., for the manufacture and repair of steel cars. J. M. Hannaford, St. Paul, Minn., is president.

The Federal Cartridge & Machinery Company, Minneapolis, Minn., has been incorporated with a capital of \$500,000 by Paul R. Seidel, Alvord C. Egelston and G. A. Austin. It will build a plant at Anoka and will manufacture small arms and ammunition.

The Minneapolis Steel & Machinery Company, Minnehaha Avenue and Twenty-ninth Street, Minneapolis, Minn., is building a new tool house parallel with its shell shop, 50 x 130 ft., two stories, of concrete and brick. It will be devoted to the manufacture, repair and storage of tools, jigs and fixtures for its shop. It is also erecting a building, 40 x 80 ft., one story, to house two new forging hammers and furnaces required for forging the tapered end of shells.

The additional manufacturing space to be added to the plant of the Imperial Brass Mfg. Company, 1200 West Harrison Street, Chicago, Ill., will give it a total of 150,000 sq. ft. of floor space, not 50,000 sq. ft., as has been stated.

The Denver Rock Drill Mfg. Company, Eighteenth and Blake streets, Denver, Colo., manufacturer of rock drills, drill sharpeners, stoppers, drifting machines, etc., is making plans for an additional building, 100 x 125 ft., one story, of brick and steel, to be used for manufacturing. Equipment orders have been placed. The cost of the addition will be about \$15,000, and has been ordered on account of an increase of over 50 per cent in its business in the last few months.

## Milwaukee

MILWAUKEE, WIS., Sept. 25, 1916.

The production of machine tools has started to show a considerable increase, due to the return to work of a large percentage of the machinists who walked out July 18. It is expected that by a week from to-day the last vestige of the trouble will have been wiped out. The 52½-hr. week, voluntarily instituted by the employers July 1, is being accepted by the strikers, who were at first firm in their position that nothing but a 48-hr. week without reduction in pay would induce them to come back. Considerably more men could be used, however, and the general shortage of labor continues to have the effect of restricting extension work required to handle orders. Orders are coming in in considerably greater volume since the beginning of last week, since word went forth that the machinists' strike is over and that labor costs will not be higher because of any reduction in the weekly working schedule.

The Organ Blowing Engineering Company, 13 West Second Street, Fond du Lac, Wis., is erecting a factory on McWilliam Street and expects to take occupancy about Nov. 1. It manufactures electrical appliances for operating pipe organs. W. H. Fagan is secretary and manager.

The Harris Brothers Company, Chicago and St. Paul, has purchased the property of the Tiger Drill Company, maker of farm implements, Beaver Dam, Wis., from the Union Investment Company. It is expected that the plant will resume operations under the new ownership.

The Esterline-Angus Company, Indianapolis, Ind., is negotiating with the Business Men's Association of Beloit, Wis., for relocating its electrical appliance works. An investment of \$50,000 is proposed.

The A. J. Lindemann & Hoverson Company, Milwaukee, manufacturing ranges, stoves and sheet-metal ware, is undertaking an extensive new construction program. Contracts have been awarded for a new enameling building, 60 x 90 ft., costing \$7,500, and tentative plans are being prepared for an addition to the six-story manufacturing plant, 100 x 120 ft. The work is in charge of Klug & Smith, consulting engineers, Mack Block.

The Cedarburg Foundry Company, Cedarburg, Wis., is now working overtime shifts and its capacity is well taken up to the end of the year. The foundry was placed in operation after a year of idleness a month ago under the new management of Frank E. Walsh and Ernest Held, West Allis, Wis.

Articles of incorporation have been filed by the Wellington Electric Company, Milwaukee. The capital stock is \$25,000 and incorporators are Henry F. Wellington, Lucas Kropfel and C. H. Juergens. It will do a manufacturing and repair business.

The Dupont Powder Company, Barksdale, near Washburn, Wis., is planning to add a box and crate manufacturing unit, costing about \$20,000. F. T. Beers is general superintendent.

The plant of the Lyons Boiler Works, DePere, Wis., is being thoroughly overhauled and the entire drive changed to electricity, in preparation for the reopening of the shops about Oct. 1 under the direction of interests owning the Joliet Bridge & Iron Company, Joliet, Ill. It is said that a new corporation is being organized to have charge, with Andrew A. Woodman as president and general manager.

The Jefferson Auto Company, Jefferson, Wis., will double the size of its garage and repair shop, making it 123 x 123 ft., one-story and basement.

The Luck Garage Company, Luck, Wis., has been organized by Edwin Tretsen, Albin Bergstrom and Robert Forsberg and will erect a garage and repair shop, 50 x 80 ft.

The Common Council, Milwaukee, is taking initial steps to obtain a site near the city hall for the proposed new light and power plant, now occupying the basement of the building. F. G. Simmons, commissioner of public works, is in charge.

Frank Hamacheck, Kewaunee, Wis., manufacturer of pea viners, canning equipment and light implements, has broken ground for his new factory and machine shop, 71 x 121 ft., one-story and basement, of reinforced concrete.

The Cornell Wood Products Company, Cornell, Wis., has started work on an addition to its plant at a cost of about \$350,000 equipped.

## Detroit

DETROIT, MICH., Sept. 25, 1916.

Conditions in the local machinery market have not changed, the demand being brisk, especially for single tools and lathes. From four to seven months is required for delivery of standard high-grade machines. Manufacturing companies are constantly increasing the size of their plants and the unusual building activity promises continued machinery business.

The labor situation in this section is becoming more acute. Skilled men are almost impossible to obtain, due to the excessive prices charged for housing and food, and several large factories have been forced to curtail their production on this account. Plans are being considered to form co-operative companies for the erection of houses, while several Detroit factories are putting up residences for their own workmen.

The W. J. Burton Company, Detroit, manufacturer of galvanized sheets, corrugated roofing, metal ceiling, etc., has moved into its new plant which covers three acres.

Work has been started on a new factory for the Parker Rust Proof Company of America, Detroit, which will employ 700 men.

The Wolverine Machinery & Supply Company, Detroit, has been incorporated with \$10,000 by Oliver D. Henry, 292 Atkinson Avenue, Detroit; George C. Whitney and William C. Kettering.

The Fuller & Sons Mfg. Company, Kalamazoo, Mich., maker of automobile parts, will expand its plant. Frank D. Fuller is president.

The Brunswick-Balke-Collender Company is erecting a tire plant at Muskegon, Mich., to be completed in 60 days. F. J. Loewe will be general manager.

The Clay Brick Company, Grand Rapids, which was recently reorganized and capitalized at \$100,000, has been sold to Chicago capitalists who will make improvements and additions to the plant. John J. Moroney, president, and other officers will remain.

H. E. Barclay, Grand Rapids, is having plans drawn by H. H. Weemhoff, architect, for a two-story brick and steel carriage and wagon factory, 30 x 80 ft.

The capital of the Kelsey Wheel Company, Detroit, has been decreased from \$1,500,000 to \$1,000,000.

The Standard Machine Company, Owosso, Mich., which recently moved from Bay City and purchased the Castree Company, in Owosso, has purchased several additional buildings, and next spring will build a two-story structure, 66 x 120 ft., to cost \$15,000. J. C. Fetter is president.

The F. G. Ruddiman Company, Muskegon, Mich., manufacturer of steel spring clip fiber mats, has increased its capital stock from \$10,000 to \$50,000 as a preliminary step toward enlarging its plant and output.

Officials of the Fay-Kultgen Foundry Company, St. Joseph, Mich., announce that a large addition to their plant will be built. Recent orders for the manufacture of automobile parts are crowding the works to capacity.

The Four Drive Tractor Company, Big Rapids, Mich., will increase its capital stock and add the manufacture of auto trucks to its products.

The Loveland Company, Detroit, through H. B. Loveland, president, has taken a lease on the plant of the Signal

Motor Truck Company and will convert the entire building into a repair shop for automobiles.

The Walcott Lathe Company, Jackson, Mich., will erect a steel building, 132 x 132 ft., on the site of the old Dennis machine shop.

The Wise Electro Sherardizing Company, Detroit, has been incorporated with \$15,000 stock by Charles L. Backus, Maxwell M. Wise, 54 Avalon Avenue, and Richard E. Bans.

J. Knappe, North and Davis streets, Grand Rapids, Mich., will build an addition to his machine shop, to cost \$5,200.

## Indianapolis

INDIANAPOLIS, IND., Sept. 25, 1916.

The addition which is being erected to the plant of the Lexington-Howard Company, manufacturer of motor cars, Connersville, Ind., will be 50 x 500 ft., one story, not 125 x 200 ft., as has been stated.

The B & B Mfg. Company, Indianapolis, Ind., maker of foundry and turning machines, has increased its capital stock from \$5,000 to \$10,000.

Fire at the Sullivan-Geiger Company's plant at Indianapolis, Sept. 20, caused a loss of several thousand dollars, both to stock and machinery. The company manufactures galvanized iron and tin products.

The Chard Lathe Company, Newcastle, Ind., has shipped three carloads of lathes to Coventry, England.

The Commercial Club, Fairmount, Ind., has made an appropriation toward the purchase of an electric sewage pump of capacity of 30,000 gal. per hr.

The Troy Chair Company, Troy, Ind., has increased its capital stock from \$12,000 to \$24,000.

The Indiana Truck Company, Marion, Ind., has increased its capital stock from \$200,000 to \$250,000.

The Hoosier Machine Company, Lebanon, Ind., has been incorporated with \$60,000 capital stock to manufacture machinery. The directors are M. Oedikirk, W. R. Callane and M. E. Callane.

The Whiteland Tile Company, Whiteland, Ind., has been incorporated with \$25,000 capital stock to manufacture tile products. William J. Wright, R. T. Ditzers and J. S. Wright are the directors.

The National Dairy Machine Company, Goshen, Ind., will build a one-story addition to its plant, 50 x 100 ft.

The Fehring Carriage Company, Columbus, Ind., has begun construction on two additions to its plant, one to be 27 x 100 ft., and the other 50 x 50 ft.

The Mowers Mfg. Company, Indianapolis, has been incorporated with \$10,000 capital stock to manufacture automobile lamps, brackets, etc. The directors are A. D., B. H. and A. Mowers.

The Standard Electric Mfg. Company, Indianapolis, has been incorporated with \$100,000 capital stock to manufacture electrical devices. Earl G. Applegate, David A. Frew and B. Frank Hall are the directors.

The O. A. Klammer Furniture Company, Evansville, Ind., has been incorporated with \$77,500 capital stock to manufacture furniture. The directors are Claude Maley, Carl G. Viehe and Daniel Wertz.

## Cleveland

CLEVELAND, OHIO, Sept. 25, 1916.

In spite of the absence of round-lot buying the machine tool market continues quite active, dealers reporting a good volume of business in orders from one to three machines, with a fair portion in the heavier types of machine tools. Deliveries on most lines of standard machines show no improvement and are holding up some sales. In other cases sales are being made for shipment up to next summer. The demand for cranes and hoists is very good, but some builders are handicapped because they are unable to secure mill motors within six months or longer. A heavy demand exists for locomotive cranes. The labor situation in local foundries shows some improvement. The American Range & Foundry Company has started up its foundry, which has been shut down for two months on account of a strike, and the Ohio Foundry Company has resumed operation in one of its plants which has been shut down for some time.

The Aluminum Castings Company, Cleveland, has acquired a site south of the city near the Harvard-Dennison car barns, on which a new plant will be erected. It will comprise a two-story main building of steel frame and reinforced concrete, 40 x 220 ft., three one-story steel frame buildings, 40 x 100 ft., 20 x 50 ft., and 20 x 100 ft., respectively, and a one-story office building. The contract has been awarded to the Austin Company, Cleveland.



The Union Chain & Mfg. Company, manufacturer of chain belting, driving chains, etc., Seville, Ohio, has increased its capital stock from \$20,000 to \$40,000 in order to take care of its rapidly growing business. Additional machinery will be purchased, including turret lathes for boring and turning sprocket wheel blanks, a multiple-spindle drill of the circular type, an automatic gear cutter suitable for series cutting, a key-seating machine, a rolling mill for reducing steel strips up to 8 in., automatic screw machines, etc. A New York office has been opened at 47 West Thirty-fourth Street, in charge of J. R. Shays, Jr.

The Peerless Drawn Steel Company, Massillon, Ohio, maker of cold drawn steel, will enlarge its plant by the erection of three brick and steel saw-tooth-roof buildings, 45 x 325 ft., 44 x 120 ft., and 40 x 120 ft., respectively. The Austin Company, Cleveland, has received the contract.

The extensions to the plant of the Canton Steel Foundry Company, Canton, Ohio, will include additions, 65 x 100 ft. and 65 x 325 ft., to the old open hearth building.

The Osgood Company, Marion, Ohio, will build a 100-ft. extension to its machine shop and structural buildings. A larger capacity has been made necessary by the recent purchase of the machinery equipment of the Ohio Tractor Company, Marion, Ohio. The contract has been awarded to the Bellefontaine Bridge & Iron Company, Bellefontaine, Ohio.

It is announced that the extensions to be made to the plant of the Alliance Machine Company, Alliance, Ohio, will include an erecting shop, 120 x 380 ft.; a two-story pattern shop, 50 x 160 ft.; two three-story pattern storage houses, each 50 x 250 ft., and a blacksmith shop 50 x 150 ft.

The Buckeye Machine Company, Lima, Ohio, will shortly begin the erection of a machine shop and foundry, approximately 400 ft. long, of steel and concrete. Expanding business has necessitated larger quarters and a new site has been acquired on which the new plant will be built.

The Gramm-Bernstein Motor Truck Company, Lima, Ohio, will build large extensions to its plant.

The Adamson Mfg. Company, Akron, Ohio, has increased its capital stock from \$150,000 to \$300,000.

The Findlay Steel Casting Company, Findlay, Ohio, has been incorporated with a capital stock of \$200,000 by E. F. Pelton, C. J. Edwards, W. B. Hale, Harry Tilden and Thomas W. Lane.

## Cincinnati

CINCINNATI, OHIO, Sept. 25, 1916.

Local demand for oxy-acetylene outfits and for oxygen is expanding rapidly, and it is reported that all three nearby plants are working to capacity and that outside firms are shipping in large quantities of the gas. Reports from various sources on the machine-tool situation differ very little, and it is generally stated that the domestic business is showing some improvement and foreign orders are still coming in. Most of the foreign business is from Europe, Canadian buying now being confined to machines that are urgently needed but that can be shipped promptly. Second-hand machinery dealers are able to dispose of all the standard sized lathes they can find.

Manufacturers of auto-trucks are working their plants to full capacity on both domestic and foreign orders. The United States Motor Truck Company, Covington, Ky., reports the receipt of an order for 25 large trucks to be shipped to Norway. It has recently filled orders from both England and France.

It is currently reported that a large addition to the Shuey Factories Building, Springfield, Ohio, is under consideration and that construction will begin as soon as the architect's plans are completed.

Contractor W. W. Kolb, 144 East Fulton Street, Columbus, Ohio, has been awarded contract for an addition to the foundry of the Herterstein Company, Columbus.

The Standard Degreasing Company, Columbus, Ohio, incorporated by Charles F. Ritter and others, will build a refining plant for extracting oils from vegetables.

The Acme Mfg. Company, Columbus, Ohio, has been incorporated with \$10,000 capital stock by A. E. Beechel and others to manufacture a patented gas sad iron.

The Sweet Laboratory Company, Columbus, Ohio, has awarded contract for a four-story building to be erected at Tompkins and High streets.

The Industrial Securities Company, Columbus, Ohio, closely allied with the Columbus Chamber of Commerce, contemplates the erection of a power and manufacturing building.

The Leidecker Tool Company, Marietta, Ohio, maker of oil-well machinery, will construct a branch plant at Basin, Wyo.

The Anderson Steam Vulcanizer Company, Cincinnati, has been incorporated with \$100,000 capital stock by Newton M. Anderson and others. Its manufacturing plans have not yet been given out.

The Stevens Mfg. Company, Dayton, Ohio, manufacturer of automobile parts, die and tool work, is moving into the former New Era Gas Engine plant at Second Street and the Pennsylvania Railroad. It intends to install a number of automatic screw machines.

Work on the new plant of the Domestic Engineering Company, Dayton, Ohio, in Moraine City suburb, is progressing rapidly. The new building, which will be used for the manufacture of farm-lighting outfits, will be one of the largest structures of its kind in the country. It will be 270 x 1000 ft., two stories, of reinforced concrete construction.

The Urbana Tool & Die Company, Urbana, Ohio, is moving into the building formerly occupied by the Urbana Woolen Mills Company. Equipment will be added.

## The Central South

LOUISVILLE, KY., Sept. 25, 1916.

The situation with regard to plant improvements here is illustrated by the fact that one of the largest surety bond writers in this section will not write construction bonds for contractors, when structural steel is involved, unless the steel is actually in the contractor's possession. Local concerns handling steel for building are taking orders only for immediate delivery when they can fill them and several local building projects are reported waiting on easier conditions in the structural steel market. Inquiries for ice-making machinery are becoming more frequent, while shops handling heavy plate work are unable to keep anywhere near orders. Several electrification projects contracted for months ago are just now being carried out.

The Louisville Water Company, Louisville, Ky., is advertising for bids until Oct. 15 for the construction and equipment of the authorized pump house to cost \$300,000. W. O. Head is president.

The Louisville Veneer Company, Louisville, Ky., is installing fifteen 440-volt alternating current motors 5 to 75 hp., direct-connected and belt driven, to replace a steam power plant. It will also install a sawmill on a timber tract purchased on Elk Creek, near Indianbottom, Ky.

The Louisville Lead & Color Company, Louisville, Ky., is putting in 14 motors and a motor generator set to supply 220-volt direct current for its 12 freight elevators.

The Kentucky Utilities Company, Lexington, Ky., was the purchaser of the electric light plants at Uniontown and Morgantown, Ky., recently reported sold. Harry Reid, president, states that the company will shortly take over other small Kentucky light and power plants.

The Roy C. Wayne Company, Louisville, Ky., is in the market for a second-hand 40 to 50-hp. single-drum electric hoist, to operate on a three-phase, 60-cycle, 220-volt circuit.

The Rutherford Auto Company, Nashville, Tenn., has applied for a charter with capital stock of \$10,000. The incorporators are A. G., D. E., J. W., C. H., and E. R. Rutherford.

The Southern Lumber Company, Johnson City, Tenn., has been incorporated with capital stock of \$10,000. E. C. Wallin, E. F. Atell, Will E. Lewis, and others, are incorporators.

William S. Whiting, Elizabethton, Tenn., is in the market for a 12-in. lathe, 20-in. lathe, 12-in. shaping machine, a power hack saw and 30-in. radial drill, all second-hand.

## Birmingham

BIRMINGHAM, ALA., Sept. 25, 1916.

Extreme activity in all industrial plants, together with high prices for this year's cotton and that held over from one and two years ago, has stimulated the machinery trade. Deliveries are the real hindrance to a greater activity. The volume of trade is expanding week by week and the expansion is in almost all lines.

The Talladega Pipe & Foundry Company, Talladega, Ala., has been incorporated with a capital stock of \$20,000 by S. C. Oliver, R. T. Hicks, H. L. McElderry, and others. It has leased the shops of the Birmingham & Atlantic Railroad and will install a sanitary pipe shop.

The Lindsey Lumber & Export Company, Mobile, Ala., is building a mill to cut 18,000,000 ft. of long leaf yellow pine, reported purchased for about \$75,000.

The Wake County Cottonseed Oil Company, Raleigh, N. C., has been incorporated with a capital stock of \$50,000 by W. A. Simpkins, J. R. Chamberlain, and others.

## Texas

AUSTIN, TEX., Sept. 23, 1916.

An unusually large number of manufacturing and other industrial projects requiring the use of machinery are under way or in prospect in Texas at this time. Money is plentiful and the machinery and tool trade is enjoying its full share of state-wide prosperity.

The Wichita Falls Electric Company, Wichita Falls, which has increased its capital stock from \$700,000 to \$775,000, will enlarge its electric light and power plant.

The West Texas Electric Company, Sweetwater, has increased its capital stock from \$300,000 to \$500,000 and will enlarge its electric light and power plant.

The Texas Company, Houston, plans to increase its capital stock from \$37,000,000 to \$44,400,000, the additional funds to be used to enlarge its oil-refining and marketing facilities.

The building which the Walker Properties Association, Austin, is erecting, will be equipped with canning machinery to turn out 75,000 cans per day. W. F. Gohlke is manager.

The Chevrolet Motor Company of Texas has been incorporated at Fort Worth for the purpose of constructing an automobile assembling plant in that city, to cost about \$600,000.

The plant of the Texas Glass Company, Texarkana, is to be enlarged in capacity about 75 per cent and machines installed to take the place of hand work. The improved plant will give employment to about 250 men.

The Texas Land & Development Company, Plainview, which has been reorganized by the election of C. J. Hubbard, Boston, Mass., as president, succeeding H. I. Miller of New York, resigned, will install more than 100 irrigation pumping plants upon shallow wells in that section for the purpose of irrigating about 60,000 acres of land.

The Texas Lockjoint Cement Silo Company, Niles City, will rebuild its silo manufacturing plant, which was recently burned.

The Cameron County Irrigation District No. 2, San Benito, which has been organized to take over the irrigation canal and ditch system of the San Benito Land & Water Company, plans to spend about \$250,000 for new pumping machinery and in the construction of canal extensions.

## St. Louis

ST. LOUIS, MO., Sept. 25, 1916.

The machine-tool business has continued very good in the local and outlying territories. Export inquiries have been received by companies having completed contracts for certain equipment and who have been asked for delivery dates and prices on repeat orders. One instance was for 40 lathes of certain sizes, while other equipment has also been sought. Prices and deliveries have been given, but orders have not yet been placed. Domestic business is holding up in good volume and while no large lots have come out, a steady demand for all classes of equipment is noted.

The Booth Cold Storage Company, St. Louis, Mo., will begin work at once on an eight-story cold-storage building, 65 x 218 ft., which, with equipment, will cost about \$2,500,000.

The Robert Breil Machine & Tool Company, St. Louis, has been incorporated with a capital stock of \$12,000 by Robert Breil and others to manufacture tools, machinery, etc.

The George V. Steffens Paper Box Company, St. Louis, has been incorporated with a capital stock of \$15,000 by George V. Steffens, Lewis R. Milliken and J. B. Reinhardt, and will equip to manufacture paper boxes and other containers.

The Lafayette Motor Car Company, St. Louis, has been incorporated with a capital stock of \$15,000 by Milton B. Strauss, Wilson H. Anderson and James A. Wolfert.

The Bussmann Mfg. Company, St. Louis, maker of fuses, has removed to 3819 North Twenty-third Street, and will increase its capacity about six times.

The Sunkel Engineering Company, St. Louis, has been incorporated with a capital stock of \$13,000 by Emil C. Sunkel, and others, and will manufacture heating, cooling, ventilating and lighting apparatus.

The Board of Public Service, St. Louis, Mo., is preparing to receive bids for heavy apparatus for handling freight on the municipal docks, to cost \$200,000.

The Liberal Impervious Face Brick Company, Liberal, Mo., has been incorporated with a capital stock of \$60,000 by C. W. Hurtgen, L. G. Morgan and Roy Todd and will equip a plant.

The E. A. Martin Machinery Company, Joplin, Mo., has been incorporated with a capital stock of \$10,000 by E. A. and L. M. Martin and Grover C. Jones, to manufacture machinery and mining equipment.

The Mosaic Asphalt Shingle Company, Edwardsville, Mo., has been organized with a capital of \$18,000 by B. B. Clawson, H. P. Hotz and C. F. Ballweg. The company has acquired a factory and work will be commenced as soon as the machinery is installed.

The Batesville Iron Works, Batesville, Ark., which has been closed for several months, will be reopened at once. John C. Evans will be manager.

The Current River Furnace & Chemical Company, Kansas City, Mo., has been incorporated with a capital stock of \$50,000 by William A. Thompson, W. H. Langford and William A. Rule, and will equip a plant for the treatment and reduction of ores and the manufacture of chemicals.

The Perfect Smoke Consumer & Fuel Economizer Company, Springfield, Mo., has been incorporated with a capital stock of \$13,000 by Thomas M. Brown, Frank W. Adams and Otis Moser, to manufacture smoke consumers.

The Robidoux Automobile Company, St. Joseph, Mo., has been incorporated with a capital stock of \$15,000 by L. T. E. O. and Dale Harvey.

The Carthage Foundry & Machine Works, Carthage, Mo., will erect and equip a plant, 74 x 143 ft., two stories.

The Columbian Steel Tank Company, Kansas City, Mo., will erect and equip a four-story manufacturing building. A five-story building will be built in 1917.

A filter plant will be built in connection with the waterworks at Galena, Mo. The mayor can be addressed.

C. H. Reed, Brays, Mo., is reported in the market for one 25-hp. steam engine, etc., for road work.

The Dayton Dick Company, Quincy, Ill., is in the market for a 100 to 125-hp., 440-volt, three-phase electric motor and other equipment.

R. A. Dowdy, and others, will equip a broom factory at Batesville, Ark., and are in the market for machinery.

The Little Rock Marble & Granite Company, Little Rock, Ark., has been incorporated with a capital stock of \$10,000 by S. E. Matthews, C. Q. Kelley, and others, and will install stone working equipment.

The St. Louis Southwestern Railway, C. D. Purdon, chief engineer, St. Louis, Mo., will equip a 24-stall round house and a machine shop at Pine Bluff, Ark.

Waterworks plants are being planned by Arkansas City, Ashdown, Beebe, Benton, Bentonville, Conway, Corning, Enders, Hartford, Hatfield, Heber Springs, Junction City, Marianna, McCrory, Piggott, Pocahontas, Portland, Rector, Springdale, Star City, Wilmot, all in Arkansas, and in each case the city clerk and the mayor may be addressed for information.

The Chess & Wymond Company, Louisville, Ky., will equip a cooperage plant at Pine Bluff, Ark., requiring about \$30,000 worth of machinery.

The Pocahontas Waterworks Improvement District, No. 1, Pocahontas, Ark., B. A. Brown, secretary, will receive bids for a complete plant including oil engine, motors, pumps, etc., filter and allied equipment.

Waynoka, Okla., will improve its electric light plant equipment at a cost of about \$25,000. Alva B. Simonds is clerk.

The Pippin Mfg. Company, Oklahoma City, Okla., has been organized by R. C. Hawley, and others, and will equip a plant for which lathes, milling, shaping, drilling and planing machines will be required.

The Oil & Gas Producers Company, Bartlesville, Okla., has been incorporated with a capital stock of \$250,000 by W. H. Byron, and others, and will be in the market for equipment.

The Western Flint Glass Company, Checotah, Okla., A. C. Dodd, manager, will install about \$15,000 worth of equipment.

The S. & S. Motor Company, Commerce, Okla., has been incorporated with a capital stock of \$15,000 by C. V. Sturat, and others, and will buy machine shop and garage equipment.

The Dupont Lumber Company, Poplarville, Miss., will remodel and enlarge its present mill, installing additional machinery.

Tehula, Miss., will equip a waterworks plant at a cost of about \$13,500. W. W. Gwin, mayor, is in charge.

The Beaumont Veneer Works, Beaumont, Miss., will add about \$4,000 worth of equipment to its plant. J. H. Overstreet is owner.

The Oak Lawn Sugar Company, Franklin, La., is in the market for engines, pumps, etc., for irrigation.

The school board, Lake Charles, La., is in the market for manual training equipment for the schools, including wood-working and iron and steel working machinery.

Shreveport, La., will install waterworks pumping station equipment to cost about \$200,000. J. B. Hawley is consulting engineer.



## The Pacific Northwest

SEATTLE, WASH., Sept. 22, 1916.

At no time for years have the iron-working plants and boiler manufacturers in the Northwest experienced such a period of unusual prosperity as now. This is largely due to the unprecedented expansion of shipbuilding which extends over the entire Pacific coast. Many tentative offers of contracts for boiler and similar work have been refused, owing to pressure of work on hand. An instance of this is a tentative contract offered by the Union Iron Works, San Francisco, to the Commercial Boiler Works, Seattle, for the construction of eighteen 1000-hp. boilers, the contract amounting to \$65,000. The Commercial Works was forced to refuse the contract, as it has orders that will keep its plant running to capacity until the spring of 1918. Prices are good, and with apparently increased activity in shipbuilding a busy winter and spring are promised for the iron works here. Similar conditions prevail in Tacoma and Portland, where every plant equipped for building marine machinery is running to capacity. Similar busy conditions prevail at the sheet-metal shops throughout Seattle. They report business in better condition than for a decade.

The J. F. Duthie Shipbuilding Company, Seattle, has been forced to refuse several tentative contracts for ships, due to pressure of work already contracted for. Although very young in the field, this company will shortly have 2000 men at work.

According to reports of the port warden, Seattle's overseas, coastwise and Alaska commerce for August has again passed the \$42,000,000 mark for a period of one month. Of this amount \$11,000,000 constituted shipments to Alaska for the month.

The Robbins Lumber Company, Spokane, Wash., plans a four-story addition to its plant at 1218 Railroad Avenue, where it manufactures bodies for automobiles, dairy wagons, etc. It will be 16 x 30 ft., of concrete and brick, and is to be equipped.

The Chamber of Commerce, Portland, Ore., is back of a project to establish a car-building plant in Portland. It is suggested that the Twohy Brothers plant, which is partially equipped for this purpose, be improved and extended.

The Port of Astoria, Ore., is installing coal-handling equipment at an expenditure of \$18,000.

The first unit of the Anaconda Copper Mining Company, Great Falls, Mont., on which work started last December, has been completed and is in operation.

The Williams Flume Patents Holding Company, Boise, Idaho, has been incorporated for \$20,000, and will construct a plant nearby for the manufacture of a metal water flume. H. S. Williams, Edwin Snow and J. L. Savage are stockholders in the company.

The Roache Timber Company, Sutherlin, Ore., is having plans prepared for an electrically operated sawmill to be built in Sutherlin. It will have capacity of 200,000 ft. daily. The company also plans the construction of 15 miles of railroad to tap its timber reserves. The combined improvements will cost \$1,500,000.

The Heath Shipbuilding Company, Portland, Ore., has recently secured a site for its proposed shipbuilding plant to be erected by George E. Hardy and E. W. Heath, the incorporators. Work on two sets of ways will begin at once, and the company expects to have two vessels under way within 30 days.

Articles of incorporation of the Three Forks Portland Cement Company, Lewiston, Mont., have been filed, with capital stock of \$2,400,000. The company has recently taken over the Hanover Gypsum Company holdings, and will construct a cement plant.

The Chicago, Milwaukee & St. Paul Railway is in the market for 10,000,000 ft. of lumber for grain doors for box cars used in the hauling of wheat.

The Kilbourne & Clark Company, Seattle, manufacturer of wireless equipment, has increased its capital stock from \$100,000 to \$1,000,000 and plans the enlargement of its plant in Seattle, and the establishment of an assembling plant in New York. The new capital will be put into improvements and extensions of its plant in Seattle.

The Minneapolis Steel & Machinery Company, Minneapolis, Minn., plans the establishment of a branch house in Great Falls, according to George M. Gillette, general manager, and N. G. Nelson, sales manager, who recently made an inspection of sites. It will construct its own building in the city, and will feature its farm tractors.

The Union Meat Company, Portland, has awarded contract for another six-story reinforced concrete and brick building to be erected at its plant at Kenton. The new structure will cost complete \$75,000.

## San Francisco

SAN FRANCISCO, Sept. 19, 1916.

The number of inquiries for metal-working tools is apparently on the increase. They are mostly small propositions, involving only a few tools, but several deals of considerable importance are under way. Especial interest is taken in the prospective navy yard requirements. Local shipbuilders have been among the largest buyers, and continue to place scattering orders as additional needs appear. The garage and small-shop business is picking up, as needs in many cases are becoming acute, while prospects of an easier market seem remote. Wood-working machinery is still rather quiet, but the outlook is improving somewhat. Milling and grain-handling equipment is in good demand. A number of large irrigation projects are under way, requiring much heavy construction work as well as pumps, etc. Inquiries are still coming fairly well from the mining districts, and some orders are appearing for gold dredging equipment, while the oil tool business is quite active. The gas engine manufacturers are very busy, and are carrying out a number of changes, most of them intending to make Diesel engines.

The Dividend Mfg. Company, Modesto, Cal., has been organized to manufacture machinery. It will specialize on a concentrator, patent for which is controlled by S. P. Coffey.

Construction has been started by the Holton Power Company, Holton, Cal., on an ice plant, which will cost about \$400,000.

It is announced that the Great Western Power Company will start work within the next year on another hydroelectric plant above Oroville, Cal., to develop about \$100,000 hp.

The Riverside Specialty Works, Riverside, Cal., capitalized at \$50,000, will build a plant for the manufacture of automobile parts.

## Canada

TORONTO, Sept. 23, 1916.

The Department of Trade and Commerce of Canada has secured an exhibit of 8000 samples of goods of German and Austrian manufacture, collected by the British Board of Trade in various parts of the world. These samples will be exhibited for two weeks each in Montreal and Toronto. The samples comprise articles of almost every line of manufacture and will be accompanied by very complete information regarding the markets, terms, prices and analysis. Mr. Kershaw, of the commercial intelligence branch of the British Board of Trade, will accompany the exhibit, and Watson Griffin, acting Commissioner of Commerce, will have charge of arrangements in Canada. While this will be only a temporary exhibit, arrangements are under way by the Trade and Commerce Department for the establishment of a permanent sample museum at Ottawa.

Mr. Just, trade commissioner for Russia, states in his report to the Department of Trade and Commerce, Ottawa, that agricultural implements, other than harvesting machinery, are in strong demand. The short supply of implements has been strikingly illustrated in gathering the hay and rye crops this season.

In New Zealand corrugated galvanized sheets are reported by Canadian Trade Commissioner Beddoe to be in substantial demand. The duty on galvanized corrugated sheets in New Zealand is £2 a ton on goods manufactured in the British Empire and £2 8s. a ton on foreign goods, thus providing a preference of 8s. for Canadian goods as compared with foreign goods. Mr. Beddoe also states that difficulty is also experienced in securing mild steel bars and structural iron in New Zealand. Orders have recently been filled for mild steel bars from India at prices below the latest Canadian quotations. This is business that has arisen since the outbreak of war and will be watched with considerable interest.

Canada's exports of nickel for the fiscal year ended June last are set forth in a government report made public recently. It states that in the year mentioned Canada exported \$6,180,998 worth of nickel to the United States, while only \$1,689,012 worth went to Great Britain. This is an increase of nearly \$2,500,000 over the previous fiscal year.

Beatty Brothers, Fergus, Ont., manufacturers of conveyor machinery, door tracks and hangers, etc., have awarded the contract to J. W. Oakes, Guelph, Ont., for the erection of an addition to their plant, of brick and concrete, to cost \$50,000.

Harley-Kay, Ltd., Georgetown, Ont., manufacturer of knitting machinery, has taken over the plant of the Georgetown Foundry & Machine Company. New buildings will be erected to accommodate the growth of the business and for the manufacture of new lines. The extensions will cost \$15,000.

The Western Drydock & Shipbuilding Company, Port Arthur, Ont., has signed contracts for the construction of two more freighters.

The Pacific Steel Products Company, Eburne, B. C., is building a plant, including a rolling mill.

The Quaker Oats Company's plant at Saskatoon, Sask., will be enlarged so that it will have a daily capacity of 1200 bbl. of flour per day instead of 600 bbl. The machinery to be installed will cost about \$45,000. A part of the plant previously unoccupied will be used to house the new plant.

The Saskatchewan Bridge & Iron Works proposes to establish a plant at Moose Jaw, Sask., and is asking the City Council to grant a special rate for electric current. George Harrison is manager.

The Canadian Northern Railway has let the contract for the erection of a machine shop at Port Arthur, Ont., to J. H. Simmons, Winnipeg, Man.

The Bryant Paper Company, Kalamazoo, Mich., proposes to build a pulp mill at Toronto to cost \$1,500,000.

The Electro Steel & Metals, Ltd., Welland, Ont., will build an addition to its foundry at a cost of \$10,000.

The Maxwell Motor Car Company will commence work shortly on the erection of a plant at Windsor, Ont., to cost \$60,000. A site was purchased some time ago.

Large additions will be made to the plant of the Maple Leaf Harvest Tool Company at Tillsonburg, Ont., and new machinery will be installed. Charles G. Evans is superintendent of the company.

The ratepayers of Niagara Falls, Ont., carried a by-law to grant concessions to the Perfection Motor & Tire Company, Madison, Wis., in return for which it will erect a plant there to cost \$35,000.

C. J. Halliday, mayor Chelsey, Ont., is in the market for one 60-cycle, 60-hp., 3-phase motor, connected to centrifugal pump for use in the pumping station.

The Waterworks Committee, Sherbrooke, Que., propose to install a vertical plunger pump with a daily capacity of 4,000,000 gal. E. C. Gatién is secretary.

Plans are being prepared by F. S. Mallory, 65 Adelaide Street East, Toronto, for the erection of a brick and concrete manufacturing plant for the Canada Metal Company, 33 Fraser Avenue, Toronto, estimated to cost \$25,000.

The Ottawa Car Company, Slater Street, Ottawa, will commence work on the erection of a brick factory to cost \$10,000.

The Adams Brothers Harness Mfg. Company, 204 King Street East, Toronto, has commenced the erection of a brick and concrete factory on King Street West, to cost \$75,000. F. Farley is superintendent.

Wilfred H. Pauze, 1822 Cote des Neiges Road, Montreal, is in the market for one wood sticker, small planer, band saw and circular saw.

The Fess Oil Burners of Canada, Ltd., Toronto, has been incorporated with a capital stock of \$100,000, by William S. Morlock, 85 Bay Street; Reginald H. Parmenter, 93 Dunvegan Road; Samuel D. Fowler, and others, to manufacture engines, oil burners, etc.

The International Metal Works, Ltd., Brockville, Ont., has been incorporated with a capital stock of \$30,000, by Thomas J. Storey, Walter J. Jarman, Ellery L. Wright and others, to manufacture automobiles, aeroplanes, etc.

The Canada Light, Heat & Welding Company, Ltd., Toronto, has been incorporated with a capital stock of \$1,000,000 by Willis B. Sturup, 6, Adelaide Street East; John F. MacGregor, 237 Beech Avenue; James W. Bicknell, and others to make calcium carbide, generators, etc.

An extension is being erected to the machine room of the Garden City Paper Mills Company, St. Catharines, Ont., 40 x 70 ft., one story.

At a meeting of the directors of the Provincial Paper Mills Company, Ltd., held in Toronto, recently, it was decided to have plans prepared for a two-machine mill to be erected at Mille Roches, Ont.

London, Ont., proposes to install a water wheel, electric generator, and a 250-hp. pump in its waterworks plant at a cost of \$15,000. E. V. Buchanan is general manager.

The West Kootenay Power & Light Company, Nelson, B. C., will install an 8000-hp. unit at its plant at Upper Bonnington Falls, B. C.

The Provincial Hydro Electric Commission will spend in the neighborhood of \$1,000,000 in doubling the equipment at its Toronto station.

St. Mary's, Ont., will call for tenders for a gasoline-driven centrifugal pump. Thomas M. Clark is town clerk.

The Richam Mfg. Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$150,000 by George A. Truman, Christopher G. Christopher, both of Hamilton; Edward Truman and Frederick Bell of Burlington, Ont., and others, to manufacture automobile tires and accessories.

The Hought Paper Mills, Ltd., Camden East, Ont., has been incorporated with a capital stock of \$100,000 by Lewis F. and Wilber E. Hought of Buffalo, N. Y.; Dan J. Albertson, Kalamazoo, Mich., and others.

The Signal Systems, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Thomas S. Jardine, William H. Irving, 10 Adelaide Street East; Henry H. Davis, 143 Bloor Street West, and others, to manufacture mechanical apparatus.

George W. Whalen has completed financial arrangements with eastern Canadian associates for the opening of pulp plants at Quatsino Sound and Swanson Bay, in addition to the present works of his company at Howe Sound, B. C. The Swanson Bay plant will have a daily capacity of 30 tons and Quatsino Sound 120 tons. The latter will be handled by the Colonial Pulp & Paper Mill, a corporation with a capital stock of \$2,500,000.

The cost of the new forge shop which is being erected for MacKinnon, Holmes & Co., Sherbrook, Que., will approximate \$25,000, not \$5,000, as has been stated.

## Government Purchases

WASHINGTON, D. C., Sept. 25, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 167, for two motor and turbine-driven centrifugal pumps for Norfolk; schedule 168, for one motor generator set for Pensacola; schedule 169, for one forcing and straightening press for Washington; schedule 170, for one electric spot welder for Pensacola; schedule 171, for one milling, drilling and boring machine, one involute gear-cutting equipment, one heavy grinding machine, miscellaneous bench, engine and turret lathes, one profiling machine, one milling machine, one automatic screw machine, one screw-slotting machine, one boring and turning mill, and two drill presses, all for Portsmouth; schedule 175, for 26 pneumatic trolley hoists for Puget Sound.

The Bureau of Yards and Docks, Navy Department, Washington, will receive sealed proposals until 11 a. m., Oct. 23, for one 20-ton locomotive crane for New York; until 11 a. m., Nov. 11, for one locomotive jib crane of 50-ton capacity for Pearl Harbor, and one 250-ton floating revolving crane for Mare Island.

Sealed proposals will be received until 2 p. m., Oct. 12 by the supervisor of the Yosemite National Park, Yosemite, Cal., for furnishing hydroelectric equipment consisting of water wheels, generators, transformers, switchboard, etc.

The general purchasing officer of the Panama Canal, Washington, will receive sealed proposals until 10.30 a. m., Oct. 14, under circular 1083, for furnishing a motor-driven grinding machine, a plate-bending roll, etc.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Sept. 19, for supplies for the naval service as follows:

### Schedule 43, Ordnance

Class 71, Puget Sound—One heavy duty engine lathe—Bid 65, \$3,390; 140, \$3,610; 153, \$3,356; 156, \$3,440 and \$3,465; 163, \$3,625.50.

### Schedule 64, Yards and Docks

Class 101, Charleston—One locomotive crane and lifting magnet and one clamshell bucket—Bid 16, \$11,299; 106, \$12,024; 124, \$12,855; 139, \$11,075; 158, informal.

### Schedule 65, Ordnance

Class 111, Philadelphia—One electric truck and crane—Bid 96, \$2,500.

### Schedule 81, Yards and Docks

Class 141, Philadelphia—One hydraulic pump—Bid 116, \$2,914; 151, \$2,264; 167, \$2,074; 200, \$2,825; 201, \$2,850 and \$3,000.

### Schedule 82, Navigation

Class 151, Annapolis—One surface condenser—Bid 16, \$2,250; 201, \$1,850.

### Schedule 84, Construction and Repair

Class 171, Philadelphia—Two horizontal centrifugal pumps—Bid 55, \$1,000 and \$925; 79, \$553.69; 126, \$772; 148, \$1,439; 201, \$720.

The names of the bidders and the numbers under which they are designated in the above list, are as follows:

Bid 16, Browning Company; 55, A. S. Cameron Steam Pump Works; 65, Hallidie Machinery Company; 79, Dayton-Dick Company; 96, Gallion Dynamic Motor Truck Company; 106, Industrial Works; 116, Kemp Machinery Company; 124, Link-Belt Company; 126, Lea-Courtney Company; 139, McMyler Interstate Company; 140, Manning, Maxwell & Moore, Inc.; 148, Morris Machine Works; 151, National Electrical Supply Company; 153, D. Naat Machinery Company; 156, Niles-Bement-Pond Company; 158, Ohio Locomotive Crane Company; 163, Perine Machinery Company; 167, Rumsey Pump Company, Ltd.; 200, Watson-Stillman Company; 201, Worthington Pump & Machinery Corporation.



